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RISK FACTOR ANALYSIS OF DIABETES MELLITUS INCIDENCE IN PRE-ELDERLY AND ELDERLY POPULATIONS IN KEDAUNG DEPOK

Ruri Firliani Darmadi[1], Ibnu Malkan Bakhrul Ilmi[2*], Avliya Quratul Marjan[3]
[1,2,3] Fakultas Ilmu Kesehatan, Universitas Pembangunan Nasional "Veteran" Jakarta, Indonesia
Email: ibnuilmi@upnvj.ac.id

ABSTRACT

Diabetes Mellitus is a medical condition characterized by elevated blood glucose levels. According to the International Diabetes Federation (IDF), Indonesia ranks fifth in the world for the highest number of diabetes cases, with 19.5 million people affected in 2021, and this number is expected to rise to 28.6 million by 2045. In Kedaung Depok Village, the number of diabetes cases in 2023 has also increased compared to the previous year. This study aims to determine the risk factors associated with the occurrence of Diabetes Mellitus in pre-elderly and elderly individuals in Kedaung Depok Village. The study used a cross-sectional design with stratified sampling. Data were collected through questionnaires and analyzed using univariate and bivariate analysis with chi-square tests. The results showed a significant association between family history and the occurrence of diabetes mellitus (p-value=0.029). However, no significant association was found between nutritional status (p-value=0.063) and carbohydrate intake (p-value=0.758) with the occurrence of diabetes mellitus in pre-elderly and elderly individuals in Kedaung Depok Village. In conclusion, family history is the most significant risk factor associated with the occurrence of diabetes mellitus in pre-elderly and elderly individuals in Kedaung Depok Village

KEYWORDS *Carbohydrate, Diabetes Mellitus, Risk Factors, Elderly, Elderly, Nutritional Status*

INTRODUCTION

In 2021, 536.6 million people worldwide have diabetes, with 205.6 million of them in the Western Pacific Region (WP). This number is expected to increase to 260.2 million by 2045[1] . In the 19-99 age group, the region with the highest number of diabetes cases in the world is the Western Pacific with 162 million people, followed by Southeast Asia which has 80 million cases[2] . Indonesia is included in a group of 39 countries that are members of the International Diabetes Federation Western Pacific region (IDF WP). In 2021, there were 19.5 million

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cases of diabetes in Indonesia, and this number is predicted to increase to 28.6 million cases by 2045[1] .

Based on health service data at the Kedaung Health Center, there was an increase in the number of people with diabetes mellitus by sub-district from 2022 to 2023, from 322 cases to 380 cases[3] . The increase in diabetes prevalence in areas such as Kedaung could be related to Depok's Human Development Index (HDI) increasing from 2020 to 2023, with a HDI of 82.53 in 2023[3] . A higher HDI usually indicates better access to healthcare and education, which can increase awareness of diabetes prevention and management. However, an increase in HDI can also reflect lifestyle changes, such as a less healthy diet and lack of physical activity, which can increase the prevalence of diabetes[3] .

Although Kelurahan Kedaung has a lower percentage of diabetes cases compared to other kelurahan in the sub-district, the significant increase in the number of people with diabetes from 2022 to 2023 indicates a trend that needs to be watched and researched further to understand the causes and triggering factors[4] . In addition, Kelurahan Kedaung may have unique risk factors compared to other areas despite the lower percentage of cases. Research in Kedaung may reveal specific risk factors such as lifestyle, diet, family history and access to health facilities. These findings are important for designing more targeted and effective interventions to prevent an increase in diabetes cases in this region.

In a study by Fatria et al (2022), there was a relationship between diet, physical activity, family history, and obesity with the incidence of diabetes mellitus in the elderly in the working area of the Sukakarya District Health Center, Sabang City, in 2022. Consumption of large portions of food can cause spikes in blood glucose, and if this habit continues, it can trigger complications of diabetes mellitus because the body is unable to use insulin optimally. Regular exercise can improve nerve function and metabolism, maintain brain health, and regulate blood pressure, triglycerides and blood sugar. Activities that burn calories are important for those at risk of diabetes[5] .

Meanwhile, research by Meilani et al (2022) also proved a clear relationship between knowledge, attitudes, and diet with the risk of diabetes mellitus (DM) in the elderly at Puskesmas Wajo, Baubau City, 2020. The habit of eating large portions can cause spikes in blood sugar. If done continuously, this condition can lead to DM complications because the body cannot use insulin properly[6] . As we age, insulin resistance tends to increase, which can increase the risk of diabetes mellitus in elderly individuals[7] .

The high incidence of diabetes mellitus is also supported by previous research, which shows that diabetes mellitus is a chronic metabolic disorder characterized by elevated blood sugar levels[8] . Diabetes mellitus is influenced by various external and internal factors. External factors include an unhealthy diet, such as the consumption of junk food, simple carbohydrates, and instant food, which is exacerbated by low physical activity. Therefore, diabetes prevention requires several important steps to prevent further complications. One of the key steps is medical nutrition therapy or dietary management, which falls under the four pillars of diabetes prevention. This therapy is effective in regulating blood glucose levels, specifically by controlling the recommended carbohydrate intake

of 35-45% of total energy requirements. This is important because carbohydrate intake, both from main meals and snacks, can affect blood glucose levels[9] .

Although many studies have been conducted, there are still many aspects that have not been studied in depth. Therefore, this study aims to analyze the risk factors that influence the incidence of diabetes mellitus in Kedaung Village, Depok. With this analysis, it is expected to provide a clearer understanding of the factors that contribute to the risk of DM in the area. The findings from this study can be used as a basis for more effective diabetes prevention and management strategies at the local community level.

RESEARCH METHOD

The researcher used a *cross sectional* research design. *Cross sectional* research design is a study to find out the correlation or relationship between risk factors and effects through approaches, observations and interviews, or data collection from August to September 2024. Cross sectional is done only with one-time observation and measurement of variables when conducting research.

This study involved 50 samples obtained from the minimum sample calculation. Data were collected using stratified sampling with the inclusion criteria of pre-elderly and elderly age, residing in Kedaung Depok Village, and willing to become respondents. This study has obtained permission from the Health Research Ethics Commission (KEPK) of PRIMA INDONESIA UNIVERSITY with letter number 025/KEPK/UNPRI/VIII/2024.

The examination of blood sugar was carried out using the *Point Care Test (POCT)* method with the *Easy Touch GCU* Meter tool which functions as a measure of blood sugar levels in the blood. The process of taking blood is carried out from the capillary vein at the tip of the finger according to the established procedure. The measurement of blood sugar levels in this study used temporary blood sugar, with levels (≥ 200 mg/dL) according to the 2019 Ministry of Health guidelines.

Food intake data were collected based on the frequency of consumption over the past month using the *Semi Quantitative Food Frequency Questionnaire (SQ-FFQ)* instrument, which includes a list of food sources of carbohydrates, animal protein, vegetable protein, vegetables, fruits, fats, and sundries that are common in the surrounding environment. Food intake was assessed based on daily, weekly, and monthly frequency. The analyzed data were then categorized based on the median, with consumption categories at the median indicating normal consumption frequency, while consumption above the median indicated excess consumption frequency.

The collected data were analyzed univariately to describe the characteristics of the respondents. Bivariate analysis using Chi-square test was applied to evaluate the association between dietary intake, family history, physical activity and nutritional status with blood sugar levels. Data processing was performed using IBM SPSS software version 26.

RESULT AND DISCUSSION

Characteristics of Respondents

Based on Table 1, it can be seen that the gender of male respondents was 7 people (14%) and female as many as 43 people (86%). The age group is divided into 2 groups, namely pre-elderly and elderly with a balanced number of 25 people each (50%). The results of the measurement of temporary blood sugar carried out, showed normal results as many as 35 people (70%) and above normal 15 people (30%). The highest nutritional status category is overnutrition with 32 people (64%) then normal 14 people (28%) and undernutrition 4 people (8%). In carbohydrate consumption, as many as 25 people (50%) respondents rarely consume and 25 people (50%) often. Family history of respondents with diabetes as many as 13 people (26%) exist and 37 people (74%) do not exist.

Table 1. Characteristics of respondents in Kedaung Depok Village

Variable	N	%
Gender		
Male	7	14
Female	43	86
Age		
Pre-elderly (45-59 years old)	25	50
Elderly (≥ 60 Years)	25	50
Blood Sugar Level at Time		
Normal (<200 mg/dL)	35	70
Diabetes (≥200 mg/dL)	15	30
Nutrition Status		
Undernourished	4	8
Normal	14	28
Over Nutrition	32	64
Carbohydrate Intake		
Rare	25	50
Frequent	25	50
Family History		
Available	13	26
None	37	74

*) *p-value* is significant if <0.05; data analyzed using *Chi-Square*

Univariate Test

Based on the results of the analysis conducted to determine the relationship between the nutritional status of the elderly and pre-elderly in Kedaung Depok Village with the incidence of diabetes mellitus, the p value (0.063). The results of statistical tests indicate that there is no significant relationship between the nutritional status of the elderly and pre-elderly with the incidence of diabetes in Kedaung Depok Village. The results of the analysis between carbohydrate intake in the elderly and pre-elderly with the incidence of diabetes showed a p value

(0.758). The statistical test results show that there is no significant relationship between carbohydrate intake of the elderly and pre-elderly with the incidence of diabetes in Kedaung Depok Village. The results of the analysis between family history and the incidence of diabetes in the elderly and pre-elderly showed p (0.029). The results of statistical tests that have been carried out show that there is a significant relationship between family history and the incidence of diabetes mellitus in the elderly and pre-elderly in Kedaung Depok Village.

Table 2. Data distribution and variable characteristics of nutritional status, food intake, physical activity and family history in Kedaung Depok based on blood glucose levels.

Variable	Current Blood Sugar Level				Test X^2 ($p < 0.05$)
	Normal		Diabetes		
	n = 35	%	n = 15	%	
Nutrition Status					
Undernourished	1	2,86	3	20	0,063
Normal	12	34,29	2	13,33	
Overnutrition	12	62,86	10	66,67	
Carbohydrate Intake Based on Median					
Rare	17	48,57	8	53,33	0,758
Often	18	51,43	7	46,67	
Family History					
Available	6	17,14	7	46,67	0,029
None	29	82,86	8	53,33	

*) *p-value* is significant if <0.05; data were analyzed using *Chi-Square*.

Discussion

Analysis of the Relationship between Nutritional Status and the Incidence of Diabetes Mellitus in Kedaung Depok Village

The results of the research that have been conducted are supported by the results of research conducted by Cindy Gita and Siti Sulandjari in 2023 which states that there is no significant relationship between nutritional status and the incidence of Diabetes Mellitus in the elderly in Kricak Village Yogyakarta[11] . However, it can be seen from the data in table 2 that the percentage of respondents with the Diabetes Mellitus group who have more nutritional status (66.67%) is higher than normal nutritional status (13.33%). This is in line with Prasetyani's (2017) explanation, which states that in obese people there is an increase in free fatty acid levels in cells caused by the accumulation of fat in the body. Unsaturated fat can inhibit the movement of glucose to body cells such as muscle and fat tissue[12] . This can lead to insulin resistance. When the body is overnourished, the energy intake that enters the body with excess will be stored in the form of fat[13] . In another study conducted by Isnaini (2018) who found that there was a relationship between Body Mass Index and the incidence of type 2 Diabetes Mellitus in the working area of Puskesmas I Wangon. The study states that people who have a Body Mass Index above normal will experience insulin resistance caused by *Free Fatty Acid* (FFA)[14] . Body Mass Index (BMI) is the

easiest way to determine nutritional status. The higher the BMI value, the greater the risk of overweight[15] .

Analysis of the Relationship between Carbohydrate Intake and the Incidence of Diabetes Mellitus in Kedaung Depok Village

The results of the research that has been conducted are supported by the results of research conducted by Cindy Gita and Siti Sulandjari in 2023 which states that there is no significant relationship between carbohydrate intake and the incidence of Diabetes Mellitus in the elderly in Kricak Village Yogyakarta[11] . Nevertheless, it can be seen from the data in table 2 that 51.43% of pre-elderly and elderly people in Kedaung Depok Village often consume carbohydrate intake. Based on the results of interviews that have been conducted, the most popular type of carbohydrate is rice with a frequency of more than once a day. The amount of carbohydrate intake that exceeds the limit can be the cause of obesity and insulin resistance. This is because the carbohydrates consumed will go through the digestive process, which is converted into glucose and absorbed by the intestines and flowed in the blood. Therefore, consuming carbohydrates in excess can increase blood sugar levels. The diet of people with diabetes mellitus can be influenced by eating habits outside the usual meal schedule[16(.)]

A person's calorie needs depend on gender. In women, daily needs are said to be sufficient around 1600 to 2400 kcal per day or equal to 25 kcal per ideal body weight. In men, daily calorie needs are calculated using the formula 30 kcal per kilogram of body weight, or about 2000-3000 kcal per day. A person is said to experience excess calories if they consume more than 2400 kcal per day for women, and more than 3000 kcal per day for men[17] .

Research conducted by Werdani and Triyani in 2014 which said that a high carbohydrate diet (>55% of total calorie needs) has a role in increasing glucose levels[18] . This is in line with the importance of paying attention to diet, especially the consumption of foods that are high in carbohydrates and fat. Excessive fat accumulation around the abdomen can trigger various metabolic disorders, so waist circumference measurement is important to identify abdominal fat. Excessive waist circumference can detect abdominal obesity, which increases the risk of developing type 2 diabetes mellitus by 5.19 times, as this measurement can predict insulin resistance-related disorders[19] . Decreased levels of the hormone estrogen in women who have entered menopause cause an increase in fat reserves, especially in the abdominal area, resulting in increased free fatty acid expenditure[20] . Nutritional adequacy is measured by comparing the amount of nutrients consumed with the body's needs, and is usually expressed as a percentage of the Nutritional Adequacy Rate (NAC)[21] .

Analysis of the Relationship between Family History and the Incidence of Diabetes Mellitus in Kedaung Depok Village

The results of the research that have been conducted are supported by research (Fatria et al., 2022) which says that family history has a significant relationship with the incidence of diabetes mellitus. Research by Prihaningtyas, 2013 also states that genetic factors play a role in the incidence of diabetes.

Someone with parents who have diabetes mellitus has the possibility of experiencing the same thing. For type 1 diabetes, if one of the siblings has DM, then the risk of the twin developing diabetes is 50% but in identical twins, the risk can increase to 100%. In type 2 diabetes, if there is a family member who has diabetes, the risk of other family members getting it is high. If someone has type 1 diabetes, the risk of developing diabetes is only 50%, but if your twin has diabetes and type 2 diabetes, the risk can increase to 90%[22] . Genes play a role in passing on traits from parent to child. Although genetics increase the risk of diabetes, it does not mean that a person will definitely develop it[23] . People with diabetes who are also overweight or obese have a higher risk of death compared to people without diabetes who have a normal weight[24] . Elderly and pre-elderly people should eat a balanced nutritious diet and routine physical activity in order to obtain a normal nutritional status[5].

CONCLUSION

Based on the results of the analysis of this study on the risk factors for the incidence of Diabetes Mellitus in pre-elderly and elderly people in Kedaung Depok Village, it is concluded that the influencing factor is family history with a *p-value* of 0.029. The results of this study are expected to increase understanding of the factors that contribute to the risk of Diabetes Mellitus in Kedaung Village. The findings of this study can be used as a basis for more effective prevention and treatment strategies for Diabetes Mellitus at the local community level.

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