Original Article

IJCIH
Converging Healthcare & Technology

International Journal of Convergence in Healthcare

Published by
IJCIH & Pratyaksh Medical Care LLP
www.ijcih.com

Lifestyle Influences the Incidence of Type 2 Diabetes Mellitus

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Abstract

Background: The prevalence of diabetes mellitus in Indonesia in 2013 by 2.1% increased from 2007 which was only 1.1% and DKI Jakarta was above the national average prevalence of 3.0%.

Objectives: Assess the influence of lifestyle (physical activity, diet, smoking behavior, and obesity) on the incidence of type 2 diabetes mellitus.

Method: This is a quantitative study with case control design. The case population in this study was all patients with type 2 diabetes mellitus and the controls were all parien who did not have diabetes mellitus. The size of the sample is calculated by using a large rusmus hypothesis test sample of 2 proportions. The minimum sample count for cases was 162 cases and 162 controls, the total sample was 324 respondents. The statistical test used is the Chi Square test.

Results: The results showed that the proportion of respondents aged ≥ 40 years (68.8%), female (49.4%), poorly educated (23.5%), there was a history of diabetes mellitus (41.4%), less physical activity (59.0%), unbalanced diet (53.7%), smoking (31.2%) and obesity (41.0%). The results of bivariate analysis showed that the variables that affect the incidence of type 2 diabetes mellitus were physical activity (p=0000, OR=4,914), diet (p=0.001, OR=2.125), and obesity (p=0000, OR=2,622). While smoking behavior has no effect on the incidence of type 2 diabetes mellitus.

Conclusion: Lifestyles that affect the incidence of Type 2 DM are lack of physical activity, unbalanced diet, and obesity. Smoking cannot be proven.

Keywords: *Type 2 diabetes mellitus, physical activity, diet, smoking behavior, obesity*

Introduction

Diabetes Mellitus (DM) or commonly known as diabetes is a metabolic disease that is a collection of symptoms that arise in a person due to an increase in blood glucose levels above normal values. Diabetes mellitus is caused by impaired glucose metabolism due to insulin deficiency both in absolute and relative terms. There are 2 types of diabetes mellitus, namely type I diabetes/juvenile diabetes, which is diabetes that is generally obtained since childhood and type 2 diabetes that is obtained after adulthood[1].

The 2014 global status report on non-communicable

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diseases issued by the World Health Organization (WHO) states that the worldwide prevalence of diabetes mellitus is estimated at 9%. While the proportion of deaths from diabetes mellitus from all deaths from non-communicable diseases is 4%. Death from diabetes mellitus occurs in low-and middle-income countries with a proportion of 80%. By 2030 it is estimated that diabetes mellitus ranks 7th cause of death in the world[2].

The International Diabetes Federation (IDF) through the Diabetes Atlas in 2015 estimated that about 415 million adults in the world had diabetes mellitus in 2015, by 2040 this will increase to 640 million. According to IDF (2015) estimates that 8.8% of the world's population has diabetes mellitus, this prevalence increased from 2014 to 8.3% and it is predicted that by 2040 the prevalence of diabetes mellitus will increase to 10.4%. In fact, Indonesia is the seventh largest country in the world after China, India, Usa, Brazil, Russia and Mexico which estimated the number of people with diabetes mellitus as many as 10 million people in 2015. According to Riskesdas 2013 data, the national prevalence of diabetes mellitus in Indonesia for the age of 15 years and above is as large as[3].

According to the Indonesian Endocrinologists Association, the criteria for a person suffering from diabetes mellitus are: 1) Blood glucose levels when ≥ 200 mg/dL taken through venous plasma or ≥ 200 mg/dL taken through capillary blood; and 2) Fasting blood glucose levels of ≥ 126 mg/dL taken through blood plasma and ≥ 100 mg/dL taken through capillary blood.

The year 2013 showed an increase in the prevalence of diabetes mellitus (diagnosed by doctors or symptoms) compared to 2007 in the age group ≥ 15 years. In 2007, the prevalence of diabetes mellitus was 1.1% while in 2013 it was 2.1% throughout Indonesia. While the prevalence of diabetes mellitus in Indonesia diagnosed by doctors was 1.5% in 2013. The prevalence of type 2 diabetes mellitus in the age group of ≥ 15 years in DKI Jakarta province is above the national prevalence average, which is 2.5% (based on a doctor's diagnosis) and by 3.0% (based on doctor's diagnosis). The prevalence of type 2 diabetes mellitus in the city of Central Jakarta according to health profile data in 2009 reached 4.8%[1].

The cause of diabetes mellitus is not solely by a single factor but the result of a combination of various risk factors. In addition to genetic factors and socio-demographic aspects, environmental factors that include lifestyle are one of the factors that cause diabetes mellitus. Lifestyle factors include diet, lack of physical activity, smoking habits, alcohol consumption, lack of rest[4]. American Diabetes Association (ADA), risk factors for type 2 diabetes mellitus are as follows: age ≥ 45 years, overweight or BMI > 25 kg/m2, history of diabetes in the family, sedentary lifestyle, race/ethnicity, history of diabetes mellitus gestatsional or have given birth to a baby weighing > 4 kg, hypertension (> 140/90 mmHg), HDL cholesterol level < 35 mg/dL and a history of cardiovascular disease. The purpose of this study is to find out the lifestyle influence on the incidence of Type 2 diabetes mellitus.

Material and Method

The type of research used is the study of observational analytics with control case design to find out whether one or more factors are risk factors of a single problem situation. In this case the factors that can be operationalized become independent variables, and the problem situation in operationalized becomes dependent variables[5]. The study was conducted in Central Jakarta. The case population in this study was all patients with type 2 DM and the controls were all parien who did not have diabetes mellitus. Sample: The size of the sample is calculated by using a large rusmus of different hypothesis test samples of 2 proportions[5]. So based on the results of calculations the minimum number of samples for cases is 162 cases and 162 controls, the total sample is 324 respondents.

Univariate Analysis: Univariate analysis is performed to get an overview of the characteristics of each variable studied. In this analysis, only allow the frequency distribution and percentage of each variable. Bivariate Analysis: The statistical test used is the chi square test between dependent variables and independent variables. Basically the Chi Square test is done to see the relationship between the observed frequency and the expected behavior.

Findings

Table 1. Characteristics of Respondents

Risk Factors	Frequency	Percentage (%)
Age		
> 40 years	223	68,8
≤ 40 years	101	31,2

Risk Factors	Frequency	Percentage (%)
Gender		
Woman	160	49,4
Man	164	50,6
Education		
Low	76	23,5
Tall	248	76,5
DM history		
Exist	134	41,4
None	190	58,6
Total	324	100

Table 1. Showing that most respondents aged > 40 years are 68.6%, more than a number of male respondents are 50.6%, Most of the respondents are highly educated which is 76.5%, and more than half of respondents do not have a DM History of 58.6%.

Table 2. Respondent's Lifestyle

Lifestyle	Frequency	Percentage (%)
Physical Activity		
Less	191	59,0
Enough	133	41,0
Diet		
Unbalanced	174	53,7
Balanced	150	46,3
Smoking Behavior		
Smoke	101	31,2
No smoking	223	68,8
Obesity		
Yes	133	41,0
Not	191	59,0
Total	324	100

Table 2. More than half of respondents did less physical activity at 59.0%, more than half of respondents had an unbalanced diet, most respondents did not smoke at 68.8%, and more than half of respondents were not obese at 59.0%.

Table 3. Chi Square Lifestyle Test Against The Incidence of Type 2 Diabetes Mellitus

Lifestyle	Type 2 DM events				Total		P-Value	PR (95% CI)
	DM		Not DM					
	n	%	n	%	n	%		
Physical Activity							0,000	4,914 (3,033-7,961)
Less	125	77,2	66	40,7	191	100		
Enough	37	22,8	96	59,3	133	100		
Diet							0,001	2,125 (1,362-3,315)
Unbalanced	102	63,0	72	44,4	174	100		
Balanced	60	37,0	90	55,6	150	100		
Smoking Behavior							0,337	1,296 (0,809-2,077)
Smoke	55	34,0	46	28,4	101	100		
No smoking	107	66,0	116	71,6	223	100		
Obesity							0,000	2,622 (1,660-4,140)
Yes	85	52,5	48	29,6	133	100		
Not	77	47,5	114	70,4	191	100		

Table 3. Showing that lifestyles that affect the incidence of Type 2 DM are less physical activity (p=0000, OR=4,914), unbalanced diet (p=0.001, OR=2.125), and obesity (p=0000, OR=2.622). Smoking cannot be proven.

Discussion

The results of the study found that physical activity had an effect on the incidence of type 2 diabetes, with a 4.9 times greater chance in those who did less physical activity. The results are in line with previous cohort studies, which stated those who did moderate to vigorous physical activity had a lower risk of type 2 diabetes (p = 0.02) analysis adjusted for sociodemographic, behavioral and health-related factors[6]

The occurrence of iabetesmlitus Type 2 can be prevented with lifestyle interventions. Lifestyle interventions are weight loss and physical activity-based interventions. Although weight loss is the most important factor for reducing the risk of diabetes incidence, it was also found that achieving target behavioral goals of at least 150 minutes of physical activity per week, even without weight loss, reduced the incidence of type 2 diabetes by 44%[7]. Any movement of the body produced by skeletal muscle that results in energy expenditure above the resting (basal) level. The term broadly includes exercise, exercise, and physical activity performed as part of daily life, work, leisure, and active transportation[8].

Previous studies have described that unhealthy lifestyle and diet are risk factors involved in the development of insulin resistance in the body's cells. In Saudi Arabia, rapid economic growth has provided people with lavish lifestyles that have ultimately led to a decline in physical activity and the adoption of unhealthy diets. The increased prevalence of type 2 mlitus diabetes in Saudi Arabia has great implications for lifestyle-related risk factors that need to be improvised for the prevention of the disease[9].

From the results of research the type of physical activity that is most widely done by case group respondents is doing homework, which is as much as 46%. There were only a few respondents who did physical activities such as jogging and cycling. Physical activity is very closely related to non-communicable diseases, because if a person does not do physical activity 30 minutes per day or 3 times a week, then there will be a buildup of fat in the body and insulin is not enough to convert glucose into energy then there will be mlitus diabetes then glucose will increase and there will be type 2 diabetes. Most of the respondents admitted that they did not do any daily physical activity, because of the busy work that just sits in the office and only move the hand muscles.

Previous research has shown that those who do not do physical activity (jogging) every day for work reasons, so jogging activities do not have time to do. Exercise is often associated with the prevention and treatment of non-communicable diseases[10] Individuals are advised to do physical activity for 30 minutes at least 4-5 times a week. Regular physical activity has been shown to reduce the risk of diabetes, hypertension and cardiovascular disease[11]

Lack of physical activity or in simple language "lazy to move" is very necessary to prevent the occurrence of mlitus diabetes. In a study said eight out of 10 people with mlitus diabetes that occurs in old age are caused by four factors of daily habits, one of which is lack of physical activity. Physical activity can control blood sugar. Glucose is converted into energy at the time of physical blessing. Physical activity causes insulin to increase so that sugar levels in the blood will be reduced. In people who rarely exercise, food substances that enter the body are not burned but stockpiled in the body as fat and sugar. If insulin is insufficient to convert glucose into energy, diabetes will arise[12]

The results found that diet influences the incidence of type 2 diabetes, with a 2.1 times greater chance in those whose diet was unbalanced. Previous research conducted in China, stated that patients with a healthier diet were affected by lower disease severity (p <.05)[13]In line with the results of research in Brazil, the results of his research also showed there is a relationship with physical activity with the occurrence of Type 2 diabetes mellitus[14].

This collaboration between CDC and other partners provides resources to promote healthy eating and physical activity in young American Indians and Alaska Natives. To assess public health needs and prevention efforts of type 1 and type 2 diabetes among adolescents, it is important to improve and continue surveillance efforts to monitor events[15].

From the results of the study of unbalanced diet in the case group is more to the group consume less fruits and vegetables every day or vegetable consumption less than 4 servings a day and fruit less than 5 servings a day and also consume more staple foods or carbohydrate sources more than 5 servings a day. Most respondents did have an unbalanced diet or more than a balanced portion. The results of interviews conducted in the case group most of the respondents did consume excessive sources of carbureboridrate and protein while eating less bua and

vegetables. This causes an increase in the level of virgin sugar in the body. Researchers assume that diet is closely related to the incidence of type 2 mlitus diabetes, if a person eats a good diet such as low-sugar consumption and high fiber (eating more fruits and vegetables) it can minimize the risk of developing type 2 diabetes.

The results of the study found no effect of smoking behavior on the incidence of type 2 diabetes mlitus. In line with previous research that states that there is no association between smoking behavior and the incidence of type 2 mlitus diabetes[16]. The results of this study contradict Sutriyawan's research, the results show there is a relationship between the habit of meokok and the incidence of non-communicable diseases such as hypertension[17].

The results of this study did not show any influence of smoking habits on the incidence of diabetes mlitus, because most of the group of cases do not smoke. This contradicts the theory that nicotine contained in cigarette smoke has an influence on the occurrence of type 2 mlitus diabetes. The effect of nicotine on insulin among them leads to decreased insulin release due to the activation of the hormone catecholamines, negative influences on insulin work, disruptions in cells β pancreas and development towards insulin resistance. Other potential mechanisms due to cigarette exposure such as cigarette exposure in pregnant and breastfeeding women also have a role in the development of insulin resistance[18].

The dangers of this cigarette are undoubtedly for a person's health. Many research results that provide results that cigarettes in addition to causing lung damage, starting only a series of infections, smoking also causes cancer of the lungs and other respiratory system. Smoking also has an impact on increasing levels of bad cholesterol and triglycerides[19].

Researchers assume that although in this study there is no relationship between smoking habits and the incidence of type 2 mlitus diabetes, but researchers agree with toeri that someone who smokes will be more likely to have type 2 diabetes than someone who does not smoke, because nicotine contained in cigarettes is very harmful to a person's health.

The results of the study found that obesity had an effect on the incidence of type 2 diabetes, with a 2.6 times greater chance in those who had obesity. In line with previous research in Denmark through cohort studies, the study states that obesity has an effect on the incidence of diabtes but is not independent of genetic tendencies[20]. Another study conducted in Palestine, stated that age > 45 years, family history of mlitus diabetes, BMI ≥ 25 kg/m2 and the presence of central obesity emerged as important risk factors for the incidence of type 2 diabetes mlitus[21].

Most of the case groups were obese or BMI≥ 27 kg/m2. So researchers assume that obesity is indeed one of the main factors that cause a person to suffer from type 2 DM, this is because if fat accumulates in the body then the sugar levels in the body will be higher. This is supported by the theory that obesity occurs due to an imbalance of input and calorie output from the body and decreased physical activity that causes fat buildup in a number of parts of the body. Obesity indicates an excessive accumulation of fat in the body, characterized by an increase in the value of the body index period above normal, people who experience more fat buildup over a long period of time will be at high risk of mlitus diabetes.

Conclusion

Based on the results of the study concluded that the lifestyle that affects the incidence of type 2 diabetes is lack of physical activity, unbalanced diet, and obesity. Smoking cannot be proven. It is expected to always do enough physical activities such as jogging, aerobic gymnastics, cycling, etc., especially for women who only do homework. It is recommended to always maintain a balanced diet by consuming carbohydrates in moderation and applying a low-fat and high-fiber diet (vegetables and fruits).

Conflict of Interest: All authors have no conflicts of interest to declare.

Source of Funding: The source of this research costs from self.

Ethical Clearance: All subjects were fully informed about the procedures and objectives of the study, each subject prior to the study signed the informed consent form.

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