The risk factors of type II diabetes mellitus in women at childbearing age

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Abstract

Purpose: This study explores the dominant risk factors which cause diabetes mellitus type II in women of childbearing age in the catchment area of Puskesmas (primary health center) Purwosari, Surakarta. **Method:** This case-control study used 150 respondents, 50 for the case group and 100 for the control group. The questionnaire includes information on family-related DM history, eating pattern, body mass index (BMI) and physical activity. Bivariate analysis used chi-square, and the multivariate used logistic regression. **Results:** The factors of DM Type II case risk are physical activity (p= 0,002; OR= 3,269; 95% CI= 1,533-6,973), family-related DM history (p= 0,004; OR= 3,121; 95% CI= 1,425-6,835), eating pattern (p= 0,016; OR= 2,646; 95% CI= 1,200-5,834) and BMI before ailing DM Type II (p=0,008; OR= 2,597; 95% CI=1,273-5,298). **Conclusion:** The dominant factor is the lack of physical activity with the probability of 3,3 times higher.

Keywords: risk factor; DM type II; eating pattern; BMI; physical activity

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INTRODUCTION

Diabetes mellitus (DM) as the "silent killer" has an increasing number of cases. In 2015, 214 million people worldwide suffered from this condition. The number increased from the 2002-data which was only 177 million people. The International Diabetes Federation (IDF) predicts that people with diabetes mellitus will increase in 2040 to 642 million sufferers [1]. The 2013 Riskesdas data showed that diabetes prevalence in Indonesia was 2.1%, which is higher compared to the 2007 prevalence (1.1%). Thirty-one provinces (93.9%) showed a significant increase in the prevalence of DM. The highest prevalence is at age ≥15 years according to doctor's diagnosis or symptoms is in Central Sulawesi Province (3.7%), then North Sulawesi (3.6%) and South Sulawesi (3.4%), while Central Java Province occupies the 21st order experienced an increase in prevalence of 1.2% in 2007 to 1.9% in 2013 [2].

In Central Java, the prevalence of diabetes mellitus has continued to increase since 2013 [3]. The number of insulin-dependent cases in 2013 was 9,376 cases (0.04%) with the highest cases in Brebes Regency and Semarang City (1,095 cases, 0.004%), while the number of insulin-dependent DM cases, was highest in Surakarta City at 22,534 cases (0.09%) [4]. DM ranked the second-highest after hypertension at 18.3% and becomes a top priority for non-communicable disease (NCD) control.

Family history of DM is 15% chance of type II DM. These genetic factors can affect beta cells and change their ability to recognize and spread insulin secretory stimuli so that the integrity and function of pancreatic beta cells changes [5]. Based on Zahtamal et al's (2007) research, family history of DM (p-value 0.001; OR =

3.75) was associated with type II DM, however, according to Fitriyani (2012), family history of DM (p-value 0.060; OR = 2.77) was not related to type II DM [6,7].

Unbalanced diet, such as foods that can be absorbed into blood sugar (sugar, chocolate, ice cream, coffee), is another risk factor [8]. Frequent consumption of coffee, fatty foods and junk food (p-value 0.026) are associated with type II DM [9]. However, another research mentioned that an unbalanced diet (p-value 0.896; OR = 1.06) was not related to type II DM [6].

Lack of physical activity and an abnormal Body Mass Index (BMI) ($\geq$27 kg/m2) can cause insulin resistance and damage the ability of beta cells to release insulin when the blood glucose increases [5]. BMI has a significant relationship with type II DM [9]. Lack of physical activity increases the risk of obesity in females. Obesity in women possessed a 50 times higher risk of causing type II DM as compared to men .

Preliminary data from Surakarta City Health Office shows that type II DM increased during the period of 2015 to 2016. Risk factors were higher in the female group. Women of childbearing age, who are pregnant and have type II DM, will risk their unborn child developing type II DM in adulthood [10]. Therefore, preventing type II DM risk on women of childbearing age would decrease intergenerational risk of type II DM. This research aims to examine risk factors for DM type II and figure out the dominant risk factors in women of childbearing age.

METHODS

This study is observational analytic case-control research, conducted on 15-17 December 2017 in the working area of Puskesmas Purwosari, Surakarta City. The populations were 291 productive women who suffered from type II DM and productive age women who did not suffer from type II DM. The study uses Proportionate Stratified Random Sampling with a total sample of 150 samples consisting of 50 case groups and 100 control groups. The questionnaire includes family history, dietary habits, body mass index (BMI) and physical activity. Bivariate analysis used the chi-square test to determine the relationship between the risk factors and type II DM. Wilcoxon test was used to determine differences between BMI before and after suffering from type II DM and a multivariate analysis using logistic regression was used to determine the dominant risk factors associated with type II DM in women of childbearing age.

RESULTS

Respondents in this study were women of childbearing age (15-64 years). Most belonged to the 55-64 years age group, 62% in the case group and 44% in the control group. Nineteen (38%) of the respondents from the case group were elementary school graduates and 34 (34%) people from the control group were high school graduates. Most work as housewives, with 35 (70%) people belonging to the case group and 55 (55%) people, to the control group. 62% in the case group and 65% in the control group earned less than 1,000,000 per month.

Table 1. Respondent characteristics

Characteristics	Case		Control	
	(n)	(%)	(n)	(%)
Age (years old)				
35-44	2	4	23	23
45-54	17	34	33	33
55-64	31	62	44	44
Total	**50**	**100**	**100**	**100**
Std. Dev	**6.22**		**7.32**	
Mean	**56.26**		**51.38**	
Min	**40**		**36**	
Max	**64**		**64**	
Educational Qualification				
Never went to school	5	10	6	6
Elementary school graduate	19	38	29	29
Middle school graduate	11	22	26	26
High school graduate	11	22	34	34
University graduate	4	8	5	5
Total	**50**	**100**	**100**	**100**

Occupation				
Civil servant	2	4	1	1
Private employee	0	0	9	9
Entrepreneur	8	16	21	21
Housewife	35	70	55	55
Labor	1	2	5	5
Others (students and unemployed)	4	8	9	9
Total	**50**	**100**	**100**	**100**
Monthly Income				
< 1.000.000	31	62	65	65
≥ 1.000.000	19	38	35	35
Total	**50**	**100**	**100**	**100**

The results showed that based on family history of type II DM, 25 people in the case group had a family history of type II DM (50%), whereas in the control group most respondents did not have a family history of type II DM, with the number of 79 people (79%). Fifty five people (55%) in the control group had a good diet, however, 36 (72%) of the case group had a poor diet. 70% of people in the control group had high physical activity, however, 58% in the case group had low physical activity. Based on the BMI, 55 people (55%) in the control group had normal BMI while 34 people (68%) in the case group (BMI before exposure to DM), were categorized as obese.

Table 2. Relationships of family DM history, diet, body mass index (BMI) and physical activity with type II DM in the working area of Purwosari Puskesmas

Variabel	Case		Control		p value	OR
	n	(%)	n	(%)		
Family History						
Present	25	50	21	21	0,000	3,762
Absent	25	50	79	79		(1,806-7,838)
Total	**50**	**100**	**100**	**100**		
Dietary Habit						
Poor	36	72	45	45	0,002	3.143
Good	14	28	55	55		(1,511-6,537)
Total	40	100	80	100		
Physical Activity						
Low	29	58	30	30	0,001	3,222
High	21	42	70	70		(1,591-6,527)
Total	**50**	**100**	**100**	**100**		
BMI (Before diagnosed with Type II DM)						
Obese	34	68	45	45	0,008	2,597
Normal	16	32	55	55		(1,273-5,298)
Total	**50**	**100**	**100**	**100**		

Physical activity had the largest OR value. Someone who has low physical activity has a risk factor for type II DM 3.269 times (95% CI = 1,533-6,973) greater than someone who has high physical activity. This shows that physical activity is a dominant risk factor for type II DM.

Table 3. Dominant risk factors related to the type II DM incidence in Purwosari Puskesmas work area

Independent variable	B	Sig.	OR	95% CI
Family history of type II DM	1,138	0,004	3,121	1,425-6,835
Dietary habit	0,973	0,016	2,646	1,200-5,834
Physical activity	1,185	0,002	3,269	1,533-6,973
Constant	-1,113			

DISCUSSIONS

Family history

Based on the results of the statistical analysis test, there was a significant correlation between family history and type II DM (p-value = 0.001 <0.05). Individuals with a family history of DM are at 3.8 times greater risk to get type II DM. This study is in line with Miller, et al. study (2016), confirming the relationship between family history of DM and type II DM (p-value = 0.003, OR = 3.67, 95% CI = 1.58-8.56) [11]. According to Bryer (2012), the risk of suffering from type II DM is very high if the family had a history or descendants of type II DM. On average, one in three children with type II diabetes will experience this disease. The risk for identical twins is 75-90%, showing an important role of genetic factors [12]. The risk increases in monozygotic twin brothers, mothers of neonates who weigh over 4 kg or individuals with obesity genes [5].

Dietary habit

This study showed a significant relationship between diet and type II DM (p-value = 0.002 <0.05). The value of OR = 3.143 (95% CI = 1,511–6,537) meant that if a person had a bad eating pattern, then the person was at 3.1 times risk of developing type II DM. Both the case group and the control group have a high tendency to consume sweet drinks (syrups, iced tea, ice cream, soft bottles), skipping breakfast, consuming animal protein (eggs, fish, shrimp, squid), eat bread (white bread or pillow bread) and eat salty foods (salted fish, salted eggs), therefore, both the case group and the control group still had a tendency to consume foods that can trigger type II DM.

The finding was in line with the results of research by Satija, et al. (2016), which stated that eating patterns are associated with type II DM (p = 0.001), where someone who consumes sweet drinks, sweets and animal protein (animal fat, milk, eggs, fish/seafood, poultry/red meat, and other animal foods) increases the risk 1, 96 times greater against type II DM [13].

Physical activity

This study showed a significant relationship between physical activity and type II DM (p-value = 0.001 <0.05). OR value = 3,222 (95% CI = 1,591-6,527), meant that if someone had a low physical activity, then the person was at risk of 3.2 times to experience type II DM. This results is relevant with Azhara and Kresnowati's study (2014), stating that physical activity is associated with type II DM (p-value = 0.002) with OR = 4,487 (95% CI = 1,667-12,080) [14]. Low physical activity causes insulin resistance in type II DM [5]. Therefore, exercise or physical activity is very important. While improving insulin resistance which becomes more effective in transporting glucose, physical activity burns calories in muscle as glucagon. The need to replace these burned calories pulls glucose out of the bloodstream, which reduces circulating sugar. Physical activity also helps reduce and maintain weight to avoid obesity, as one type II DM triggers [12].

BMI

There was a significant relationship between BMI (before being exposed to type II DM) and type II DM (p-value = 0.008) with OR value = 2.597 (95% CI = 1,273-5,298). Hence, someone who was obese, was at risk 2.6 times to experience type II DM. This study was in line with research by Dhana, K., et al. (2016), the value of p = 0.001 <0.05 stated there is a relationship between obesity, where obese women are 5.3 times more at risk of suffering from type II DM (OR = 5.3, 95% CI 1.6-9.3). The risk of developing type II DM increases with weight gain, even within normal limits, women have lower physical activity than men [15]. The theory supports the results of the study, where all respondents in this study were women and most respondents in the case group were obese and had low physical activity.

CONCLUSION

The dominant risk factor associated with type II DM in women of childbearing age is physical activity (OR = 3.3) because most respondents are housewives who have the highest physical activity such lying or

sitting while watching tv (84%). These activities have a dominant influence on type II DM in women of childbearing age in the working area of the Purwosari Primary Health Centers in 2017. Further screening for women of childbearing age should be taken as early preventive measures for type II DM.

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