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## Diabetic Mellitus Type 2 in Wajo South Sulawesi, Indonesia

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### KEYWORDS

Risk factors,  
early detection,  
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### A B S T R A C T

The prevalence of type 2 diabetes is increasing in all populations worldwide. The research aimed to analyze the relationship risk of the Type 2 DM. This study was a cross sectional study. Samples in the research were 300 samples from eligible population. Data collection was carried out through interviews, antropometry measurement and uptake of blood sugar. The data were analyzed by using a Chi square test and multivariate analysis with the logistic regression test with Alfa 5%. The result showed that central obesity ( $p=0,000$ ), vegetable and fruit consumption ( $p=0,000$ ), physical activities ( $p=0,033$ ), smoking ( $p=0,000$ ) and stress ( $p=0,021$ ) have the relationship with the occurrence of Type 2 DM. Logistic regression showed that the consumption of vegetable and fruit is the most influential factors on the occurrence of Type 2 DM ( $p=0,000$ ). Recommendation study expected that policy makers develop diabetes control programs, especially in high-risk populations. Its need to manage of weight and improving of vegetables and fruit consumption. And for communities to control blood glucose regularly.

## Introduction

Diabetes mellitus has become a serious threat to humans in the world. In 2003, the WHO estimates that 194 million people or 5.1 % of the 3.8 billion people in the world suffers from diabetes aged 20-79 years and in 2025 is expected to increase to 333 million people (Madina, 2011). Epidemiology of diabetes during the last 20 years shows a remarkable development, the current global epidemic of diabetes become. Countries of low and middle income face

the greatest burden of DM. World Health Organization (WHO) predicts an increase in the number of people with diabetes in Indonesia from 8.4 million in 2000 to around 21.3 million in 2030 (Perkeni, 2006). The prevalence of diabetes is higher in individuals who have more weight and obese, the hypertensive group and in the groups with less physical activity (Directorate NCD, 2008).

Based Health Research (Riskasdas) 2007, The prevalence of diabetes is multiple risk factors, such as central obesity 18.8 %, Glucose Intolerance 10.2 %, 23.7 % smoking habits, less fruit and vegetable consumption 93.6 %, 4.6 % alcohol drinking habits and less physical activities such as sports 48.2 % (Agency for Healthcare Research & Development Health Department, Republic of Indonesia. 2008).

In Bone district people with type 2 diabetes are known mostly at the age of 45-49 years (22.1 %) (Ramlah, 2009) and research conducted Ratnaningsih (2009) in Yogyakarta is known that respondents with aged 40-59 years is most were encountered, i.e. 52.4 %, followed by the final adult respondents was 43.5 %, the data obtained showed that diabetes mellitus is more widely experienced by middle aged adults and late adult (40 years and above) (Ratnaningsih, 2009).

Being overweight is a major risk factor for diabetes, another contributing factor is physical inactivity, the less physical activity that is done the greater the risk for developing diabetes, physical activity helps a person to control weight. Research by Arief (2009) suggests physical activity is a risk factor for type 2 diabetes with OR 3.27, while research Xu, Weili, et.al (2005) showed obesity increases the risk of type 2 diabetes (OR = 3.39). This is consistent with studies in Finland found that central obesity associated with glucose tolerance (Lindstrom, et.al, 2003).

Another factor is smoking causes spasms and constriction of blood vessels. The researchers say that smoking can also lead to conditions that are resistant to insulin. People who smoked  $\geq 20$  cigarettes / day had a higher incidence of diabetes than non-

smokers (OR 2.66) (Gabrielle, Capri, et.al, 2005). In addition to the high stress levels of 1.59 times the risk of developing diabetes than those who rarely stress (Fitrawati, Gita, 2010).

Epidemiologically, type 2 diabetes often go undetected and say onset or start of diabetes was 7 years before the diagnosis is made early so that morbidity and mortality occur in cases that are not detected (FK - UI, 2011). Several studies were conducted with a cross -sectional study design found that patients with type 2 diabetes have not been diagnosed with diabetes knows himself higher than DM patients who had been diagnosed previously (Xu, Weili, et.al, 2012).

One of the second -level prevention is early diagnosis through screening program (screening) which is an early detection of a disease or an attempt to identify the disease or disorder is not clinically apparent by examination or procedure using a specific test that can be used to quickly distinguish those apparently healthy but actually suffer from a disorder. DM screening is useful for capturing patients with type 2 DM and DM without a previous diagnosis (Noor, NN, 2008).

The prevalence of diabetes diagnosis by health professionals in South Sulawesi is 0.8 % and Wajo ranks 9th out of 23 districts, namely 0.9 %. This suggests that the prevalence is higher than the prevalence Kab. Wajo South Sulawesi Province (Agency for Healthcare Research & the Development Department of Health, 2008). The increase in cases of diabetes occurs every year in Wajo. The prevalence of DM in 2010-2012 in a row is a 12:23 %, 12:25 % and 0.3 %. In 2012, cases of DM were highest in the District of Tempe by 0.5 % (DHO Wajo, 2012).

## **Materials and Methods**

This study has been conducted in Wajo district, South Sulawesi Indonesia. Type of study is an observational study with cross sectional design. The population in this study was all residents of the District of Wajo. The sample were residents in the Village Siengkang District Wajo. 300 samples were observed, among others, aged 40-59 years, and is willing to be the subject of study by signing an informed consent, women who are not pregnant and do not suffer from other chronic diseases.

The data collection was done by direct interviews with selected respondents by using a questionnaire about, food frequency, physical activity, smoking, stress (Holmes scale) and the question of early detection (modification score of AUSDRISK). In addition, primary data obtained through anthropometric measurements and collection of capillary blood plasma (blood glucose levels of As). This study has examined by ethic commission board of Hasanuddin university in 2013.

The data were processed using STATA program. Univariate analysis to determine the characteristics of respondents. Bivariate analysis with Chi square test to examine the relationship of variables that include independent variables and the dependent variable. Multivariate analysis with logistic regression to determine which variables are most associated with the incidence of Type 2 Diabetes Mellitus. And a validity test for screening.

## **Result and Discussion**

Table 1 shows the characteristics of respondents Based on the incidence of DM, 35.67 % of respondents suffer from diabetes. Study found that sex distribution of the most abundant in the female sex as many as 56.33

%. Then, study found distribution of respondents by age group most are in the age group of 55-59 years as much as 27.67 %.

Distribution of respondents by level of education are most numerous in the level of high school education is as much as 32.33 % and respondents who never went to school as many as 2:00 %. Distribution of respondents based on the work of the most housewife is 36.67 % and at least the respondents who a job as a laborer had been 1.67 %.

In Table 2 the results showed that the incidence of Type 2 Diabetes Mellitus in central obese respondents (abdominal circumference > 80 cm in women and > 90 cm in men) is 46.29 % (n = 81). Statistical test showed association between central obesity with the incidence of Type 2 Diabetes Mellitus (p = 0.000). The prevalence ratio obtained for 2.23. This means that the incidence of Type 2 diabetes in those who are central obese 2.23 times more than those who are not central obese.

Distribution of respondents based on the consumption of vegetables and fruits showed that respondents with less fiber number Type 2 diabetes mellitus is 50.92 %. Statistical test results showed an association with fruit and vegetable consumption incidence of Type 2 Diabetes Mellitus (p = 0.000). The proportion of incident type 2 diabetes has been 2.91 times more often in those who consume less fruit and vegetables than those who consume enough vegetables and fruit (prevalence ratio = 2.91). The incidence of Type 2 Diabetes Mellitus occurs in less physical activity, respondents with 39.71 %. The test results found a statistical relationship of physical activity with the incidence of type 2 diabetes mellitus (p = 0.033). The ratio of the prevalence rate was 1.47.

The incidence of Type 2 Diabetes Mellitus occurs in 68.49 % light smokers with smoking severity 1-199 rod while respondents with moderate smokers (200-599 stems) with type 2 diabetes mellitus by 54.55 %. The number of respondent who do not smoke and do not suffer from diabetes at is 66.07%. Statistical test results showed no association between smoking and the incidence of Type 2 Diabetes Mellitus ( $p = 0.000$ ). Under stress, the stresses of respondents who suffer from DM by 42.18 % and 57.82 % of respondents who do not suffer from stress Type 2 diabetes. Based on statistical tests that have been done show no correlation with the incidence of stress Diabetes Mellitus, Type 2 ( $p = 0.021$ ). The proportion of incident type 2 diabetes has been 1.43 times more often in those with their stress with no stress.

Multivariate analysis in table 3 shows that statistically significant based on the results of the logistic regression analysis, the variable most related to the incidence of Type 2 Diabetes Mellitus central obesity ( $p = 0.000$ ).

Obesity is an important indicator of fat distribution in the body, especially the abdomen showed no metabolic changes including insulin resistance by measuring the abdominal circumference. Statistical test results showed no association between central obesity with the incidence of Type 2 Diabetes Mellitus ( $p = 0.000$ ). Lofgren, et al. (2004) found that the size of the abdominal circumference (waist circumference) is associated with insulin levels.

A balanced diet is the food consumed must meet quality and quantity, and consists of a source of carbohydrates, animal and vegetable sources of protein, fat and a source of vitamins and minerals. Statistical

test results showed no association with fruit and vegetable consumption incidence of Type 2 Diabetes Mellitus ( $p = 0.000$ ) and multivariate test based, consumption of fruits and vegetables are the most variable associated with the incidence of type 2 diabetes mellitus among other variables. This is consistent with research conducted by Handy et al. (2007) and Soetiarto, Farida, et al. (2010) who found no association of fiber intake (fruits and vegetables) to occurrence DM. In contrast to other research, the findings Waridiyati (2006) in Magelang Tidar General Hospital showed no association of fiber intake with the incidence of type 2 DM. According Sukardji, Kartini (2009), people with diabetes are encouraged to consume 20 - 35gr fibers of various foodstuffs. In Indonesia, advocacy is approximately 25 gr/1000 calories / day with emphasis on soluble fiber.

Physical activity is all the body movement that burns calories, such as sweeping, up and down stairs, ironing, gardening and exercising certain. Aerobic exercise followed a series of irregular motion will strengthen and develop muscles and all parts of the body. These include walking, swimming, cycling, jogging or gymnastics (Tandra, 2007). The analysis showed that the association of physical activity with the incidence of type 2 diabetes mellitus ( $p = 0.0332$ ). The study is consistent with research conducted Anani, Sri, et al (2012) in hospitals Arjawinangun Kab. Cirebon Indonesia with cross-sectional studies indicate that physical activity associated with blood glucose levels ( $p = 0.012$ ). Smoking is a global problem. The prevalence of smoking is still quite high and the risks related to the disease and the high mortality rate (Hariadi S, 2008).

**Table.1** Distribution Characteristics of Samples in the Village District of Tempe Sengkang Wajo In 2013

Variable	N	%
<b>DM</b>		
Not cases	193	64.33
cases	107	35.67
<b>sex</b>		
Male	125	41.67
Female	175	58.33
<b>Age group</b>		
40-44	63	21.00
45-49	82	27.33
50-54	72	24.00
55-59	83	27.67
<b>Education level</b>		
Never school	6	2.00
Un finish elementary	33	11.00
Elementary	68	22.67
Junior high school	68	22.67
Senior high school	97	32.33
University	28	9.33
<b>Occupation</b>		
Not work	35	11.67
Housewife	110	36.67
government	59	19.67
private sector	70	23.33
Labor	5	1.67
Retired	21	7.00
<b>Total</b>	<b>253</b>	<b>100,0</b>

**Table.2** Relations Obesity , Fruit and Vegetable Consumption , Physical Activity , Smoking and Stress with incident Type 2 Diabetes Mellitus in Sub Sengkang District of Tempe in 2013

Risk Factors	DM Type 2				Total		P
	DM		Non DM		n	%	
	n	%	n	%			
Central obesity							
Obesity	81	46.3	94		175	100.0	
Not Obesity	26	20.8	99	79.2	125	100.0	
Vegetable consumption							0.000
Less fiber	83	50.9	80	49.1	163	100.0	
Enough fiber	24	17.5	113	82.5	137	100.0	
Less activity	193	87.7	27	12.3	220	100.0	0.033
Enough activity	24	72.7	9	27.3	33	100.0	
Smoking							0.000
Heavy smoker	1	100.0	0	0.00	1	100.0	
Mild smoker	12	54.55	10	45.45	22	100.0	
Light smoker	50	68.49	23	31.51	73	100.0	
Non smoker	44	33.93	160	66.07	204	100.0	
Stress							
Stress	62	42.2	85	57.82	147	100.0	0.021
Not stress	45	29.4	108	70.59	153	100.0	

**Table.3** Multiple Logistic Regression Diabetes Mellitus, Type 2 in Sengkang Tempe Wajo district 2013

Variable	Coefficient	z	OR	95% CI		P
				LL	UL	
Central obesity	1,468	4,57	4,34	2,311	8,148	0,000
Vegetable consumption	1,461	4,75	4,31	2,358	7,874	0,000
Physical activity	0,935	2,81	2,55	1,328	4,882	0,000
Smoking	1,357	5,53	3,88	2,401	6,283	0,005
Const.	-3,654					

Statistical test results showed no association between smoking and the incidence of Type 2 Diabetes Mellitus ( $p = 0.000$ ). This is in line with research Gabrielle, Capri, et.al (2005) showed that there is a relationship of smoking to the incidence of Type 2 diabetes mellitus ( $p = 0.001$ ) with OR about 2.66. Neither study by Houston also found that current smokers had a 76 % higher risk of developing Type 2 diabetes than those not exposed (Irawan, 2010). Smoking directly improves insulin resistance. The Insulin is response to an oral glucose load more in smokers than non-smokers. Smokers have the characteristic of the insulin resistance syndrome, including increased fasting blood sugar (Chiolero 2008 in Jafar, 2011).

Most people do not realize the impact of stress on the incidence of type 2 diabetes. Stress can occur at almost all levels of age and even older people can also experience it. Based on statistical tests that have been done show no correlation with the incidence of stress Diabetes Mellitus, Type 2 ( $p = 0.0210$ ). The results are consistent with research Trisnawati, et al (2013) found that there is a significant relationship between stress and the incidence of type 2 diabetes mellitus.

The body's response to emotional, mental health is a hormone and neurotransmitter secretion of hormones, including the most dominant adrenaline is spending that will trigger blood sugar needs. In addition, the

increased risk of diabetes in the stress condition caused by excessive production of the hormone cortisol when a person experiences stress (Siagian, 2012 in Trisnawati, 2013).

Several questionnaires have been developed to capture undiagnosed diabetics and include symptoms and risk factors. If a person has any of the symptoms of diabetes (thirst, polyuria) and diabetes mellitus confirmed the diagnosis process is not screening. The main goal of screening is to detect those who were asymptomatic and undiagnosed DM so that the questionnaire based on symptoms not included in the screening tool (WHO, 2003).

### Conclusions

Risk factors (central obesity, fruit and vegetable consumption, smoking and stress) associated with the incidence of type 2 Diabetes Mellitus. Recommendation study 1. Expected that policy makers develop diabetes control programs, especially in high- risk populations so that early treatment can be performed on patients with diabetes mellitus type socialization 2. Need management of weight loss, especially in women and mobilization consumption of vegetables and fruits (especially local vegetables and fruits) and education patterns of food consumption on the incidence of the risk of type 2 Diabetes Mellitus in the community. For patients with Diabetes

Mellitus can be more disciplined in disease management, including control of blood sugar and regular treatment to prevent complications

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