The relationship between waist circumference on obesity and prevalence of type 2 diabetes mellitus in male patients in the Regional Public Hospital of Tabanan Regency

L G Evayanti [1*], B G A D Hendra [1], S H Indonesiani [1]
[1] Faculty of Medicine and Health Sciences, Universitas Warmadewa, Denpasar, Bali

[*] luhgdeevayanti@gmail.com

Abstract. Obesity is a major factor of type 2 diabetes mellitus (DM). The measurement of waist circumference is one method to diagnose obesity. The aim of this study was to determine the relationship between waist circumference on obesity and prevalence of type 2 DM in male patients in the Regional Public Hospital of Tabanan Regency. The design of this study was cross-sectional study. The subjects of this study were all adult male patients with type 2 diabetes mellitus or obesity in Internal Medicine Clinic in the Regional Public Hospital of Tabanan Regency, who were selected using consecutive sampling (September – December 2017). Waist circumference was measured by cloth measuring tape. Random blood glucose level was measured using finger prick blood glucose tests (Easy Touch GCU). Data were analyzed by SPSS application using Chi-square test (p value < 0.05). Based on the results of this study shown that there was significant relationship between obesity and type 2 DM ($p < 0.05$; $r = 0.396$). Waist circumference appeared more evidently related with type 2 DM. Our findings provide useful information for the projection of increasing prevalence of type 2 DM in male patients.
Keyword : Relationship, Prevalence, Public Hospital.

1 Introduction

Type 2 diabetes mellitus (T2DM) is a metabolic disease characterized by hyperglycemia resulting from a combination of resistance to insulin action and an inadequate compensatory insulin secretory response. The long term complications of diabetes mellitus is associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels [1]. Diabetes mellitus is one of health problems in developing countries, especially Indonesia. In 2013, the prevalence of diabetes mellitus in Indonesia is 12.191.564 people (aged > 15 years in urban areas) [2]. In the Regional Public Hospital of Tabanan Regency, the prevalence of diabetes mellitus was increased from 174 patients (2014) to 280 patients (2015). Hyperglycemia can cause pathologic and functional changes in various target tissues, but without clinical symptoms, may be present for a long period of time before diabetes mellitus is detected [3].

Type 2 diabetes mellitus is associated with obesity. Body mass index is general indicator of obesity, but not reliable for distribution of obesity [4]. Waist circumference is a method to assess central obesity and also strongly correlated with T2DM in European and Asian adults [5]. While changes in body mass index have been well documented in the Regional Public

Hospital of Tabanan Regency, changes in waist circumference are not well described. The purpose of this study is determine the relationship between waist circumference on obesity and prevalence of T2DM in male patients in the Regional Public Hospital of Tabanan Regency.

2 Method

The design of this study was cross-sectional study. The participants were all adult male patients with type 2 diabetes mellitus or obesity in Internal Medicine Clinic in the Regional Public Hospital of Tabanan Regency, who were selected using consecutive sampling (September – December 2017). Waist circumference, recorded to the nearest 0.1 cm, was taken with a cloth measuring tape and was measured on bare skin at the midline between the lower border of the ribs and the iliac crest in the horizontal plane after a normal expiration. Previously diagnosed type 2 DM was identified by medical records and then confirmed using random blood glucose level. Random blood glucose level was measured using finger prick blood glucose tests (Easy Touch GCU). Both of measurements were recorded by trained staff. Data were analyzed by SPSS application using Chi-square test (p value < 0.05).

3 Results And Discussion

The number of participants in this study was 53 people. The characteristics of male participants in the Regional Public Hospital of Tabanan Regency were shown in Table 1.

Table 1. Characteristics of male participants

Parameters	Frequency (n = 53)	Percentage (%)
Age range (years)		
21-30	9	17.0
31-40	15	28.3
41-50	24	45.3
51-60	5	9.4
Waist circumference		
Obese patients	28	52.8
Non-obese patients	25	47.2
Family history of DM		
Yes	23	43.4
No	30	56.6
Patient history of Type 2 DM		
Yes	29	54.7
No	24	45.3

The number of type 2 DM participants with obesity was higher than the number of type 2 DM participants without obesity. Based on the results of this study shown that there was significant relationship between obesity and type 2 DM ($p < 0.05$; $r = 0.396$). The relationship between waist circumference and type 2 DM was shown in table 2.

Table 2. The relationship between waist circumference and type 2 DM in male participants

Parameters		Type 2 Diabetes Mellitus		Total	p Value
		Yes	No		
Waist Circumference	Obese patients	21 (75%)	7 (25%)	28 (100%)	0.02
	Non-obese patients	8 (32%)	17 (68%)	25 (100%)	
Total		29 (54.7%)	24 (45.3%)	53 (100%)	

The risk factors of type 2 DM include age, family history of DM, lifestyle, obesity, and others. People over 40 years old are more diagnosed with type 2 DM than people under 40 years old [6]. Body metabolism on old age tends to decrease [7]. In addition, decreased activity and increased food consumption can cause type 2 DM on old age. Fat distribution can be measured by waist circumference and waist-to-hip ratio [8]. Based on this study, waist circumference on obesity and type 2 DM had positive relationship significantly ($p < 0.05$; $r = 0.396$). In other study, there was significant relationship between waist circumference and risk of type 2 DM, particularly among persons of low or normal weight [9]. Sofiana reported that people with waist circumference exceeding normal risk 8.419 times suffer from DM than people with normal waist circumference [10]. Waist circumference may be a better indicators than waist-to-hip ratio for risk of diabetes. Chan et al. reported that there was strong positive association between overall obesity as measured by body mass index (BMI) and risk of diabetes with multivariate relative risks of 42.1 (95% confidence interval 22.0-80.6). Waist circumference was positively associated with the risk of type 2 diabetes among the top 20% of the cohort, while waist-to-hip ratio was a good predictor of type 2 diabetes only among the top 5% [8].

Accumulating evidence supports abdominal fat associated with insulin resistance. Dysfunctions of adipokine pathways often result metabolic abnormalities in multiple tissues thereby constituting a critical pathological component in the development of metabolic disease on obese people [11]. M1 macrophages secrete adipocytokines and produce reactive oxygen species, which induce insulin resistance. Adipocytokines are abundantly expressed in visceral fat tissue such as TNFα and IL-6 [12]. Furthermore, adiponectin are expressed lower than adipocytokines in obese people [13]. Harke et al. reported that abdominal obesity in diabetic females correlates with altered levels of adipocytokines [14].

4 Conclusions

In summary, this study reported that waist circumference on obesity and type 2 DM have positive relationship significantly in the Regional Public Hospital of Tabanan Regency. Waist circumference were good indicator for the relationship between abdominal adiposity and risk of diabetes.

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