

Visceral Fat and Type 2 Diabetes Mellitus:

A Cross-Sectional Study At Klinik Kesihatan Putrajaya Presint 9

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Abstract Excess visceral fat was associated with T2DM in which visceral fat accumulation was influenced by multiple genetic and environmental factors. This study was designed to determine the association between visceral fat and T2DM by using Bioelectrical Impedance Analysis (BIA). Besides that, this study aimed to compare visceral fat quantity and to determine factors affecting visceral fat quantity among T2DM and non-diabetic patients. This cross-sectional study was conducted at diabetic and outpatient clinics in KK Putrajaya Presint 9. The patients were screened using convenient sampling according to the inclusion and exclusion criteria. A validated data collection form was used during the data collection period to record the details of every patient. 263 patients were involved in this study. There was a significant association between visceral fat and T2DM ($p < 0.001$) where T2DM patients had higher visceral fat quantity than the non-diabetic patients ($p < 0.001$). Generally, men had higher visceral fat quantity ($p < 0.001$). Besides that, there was a significant difference of visceral fat quantity between Malay and non-Malay T2DM patients ($p = 0.025$). Malay patients were found to have higher visceral fat quantity. Higher BMI also contributed to higher visceral fat quantity in both population of patients ($p < 0.001$). Patients should be more aware of their visceral fat quantity and modify their lifestyle to prevent T2DM. Healthcare providers can take into consideration to monitor visceral fat quantity during health check-up for prediabetes and T2DM patients.

Keywords Bioelectrical Impedance Analysis, Type 2 Diabetes Mellitus, Visceral fat

1. Introduction

Diabetes mellitus is a chronic disease and is no longer an epidemic that can be ignored. In 2014, World Health Organization (WHO) estimated about 422 million adults aged over 18 years having diabetes.¹ One of the largest numbers of people with diabetes were estimated from the South-East Asia region. Similarly, diabetes epidemic in Malaysia shows an increasing trend over the years. The national prevalence of diabetes in adults is 16.9% in 2017.² The prevalence of diabetes among adults in Malaysia is projected to rise to 21.6% by the year 2020.³

Visceral fat is composed of several adipose depots. It is the body fat deposited around abdominal viscera in mesentery and omentum. Visceral fat accounts for up to 10–20% of total fat in men and 5–8% in women.⁴ Excess visceral adiposity is associated with impaired glucose tolerance, insulin resistance, and atherogenic dyslipidaemia. Increased risk of developing diabetes is greater in individuals with excess visceral adipose tissue (VAT).⁵ Visceral adiposity has greater endocrine activity than subcutaneous fat and has been proposed as a marker of dysfunctional adipose tissue and ectopic fat deposition.⁶

VAT accumulation is influenced by multiple genetic and environmental factors. The risk for metabolic disease increases with age. In both men and women, increasing age is associ-

ated with a worsening blood lipid profile with increased low density lipoprotein (LDL) concentration, alterations in lipoprotein-lipid metabolism and plasma glucose homeostasis besides accumulation of visceral fat.⁷ For a given BMI, men were reported to have more visceral and hepatic adipose tissue, whereas women had more peripheral or subcutaneous adipose tissue.⁸ Most of the patients with T2DM are overweight or obese. Excess weight itself can cause insulin resistance. Patients who are not obese or overweight by traditional weight criteria may have an increased percentage of body fat distributed predominantly in the abdominal region.⁹

Bioelectrical Impedance Analysis (BIA) has been developed as a valid tool to measure visceral fat. BIA has advantage in which subjects are not exposed to radiation. Besides that, it is a method that is easy to use, non-invasive, inexpensive, non-time consuming, reproducible and portable.¹⁰ A previous study reported that visceral fat area measures estimated by whole-body BIA were correlated with those measured by computed tomography (CT) scans.¹¹