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Vaspin in Developing Obesity (Vande-Ob); the Correlation of Waist Circumference and Visceral Fat Percentage with Vaspin Levels in Patients with Type II Diabetes Mellitus

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Keywords: Vaspin; Waist circumference; Visceral fat percentage; Type II diabetes mellitus

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Abstract

BACKGROUND: Vaspin concentration was thought to be associated with obesity, impaired insulin sensitivity, and fitness level. The correlation of vaspin and leptin supports the theory of vaspin associated with body fat mass.

AIM: To determine the correlation between visceral fat distributions and serum vaspin level in type II DM patients.

METHODS: We conduct an observational, analytical cross-sectional study. Sixty subjects with type II diabetes mellitus who came to Diabetes Center of Sanglah General Hospital were included consecutively. Each subject has to sign an informed consent before physical and laboratory examination took place. Spearman correlation test was used to analyse the correlation between waist circumference and visceral fat percentage with serum vaspin level since the data were not distributed normally.

RESULTS: Mean laboratory results in all subjects of vaspin levels was 2.389 ± 3.586 ng/ml, mean waist circumference was 94.95 ± 11.78 cm and mean visceral fat percentage was 18.05 ± 23.63%. We found we found no significant correlation between between vaspin with waist circumference (r = -0.044; p = 0.738) and visceral fat percentage (r = -0.103; p = 0.435).

CONCLUSIONS: The vaspin level did not significantly correlate with waist circumference and visceral fat percentage in type II diabetes patients.

Introduction

Diabetes mellitus (DM) is one of medical and social health problems both in developed and developing countries. The prevalence is increasing, and approximately 4% of the world population suffered from DM. This disease is closely related to obesity and endocrinal activity of adipose tissue [1].

The association between the increase of body weight and waist-hip ratio (WHR) with the incidence of impaired glucose tolerance, dyslipidemia (primarily hypertriglyceridemia) and hypertension firstly reported in detail at various population-based studies in the early 1980s. The combination of symptoms, which are known as metabolic syndrome, is reported as a major cause of the global epidemic and death caused by DM and cardiovascular disease. However, those studies have not comprehensively described the involvement of adipose tissue with glucose metabolism [1], [2], [3].

The visceral fat tissue is not only involved as fat-storage but also as an active endocrine organ, in which the occurrence of obesity is causing hyperplastic changes in this tissue [3]. Vaspin (visceral adipose tissue-derived serine protease inhibitor) is the most recent adipocytokine exclusively expressed by rat visceral fat tissue, which is Otsuka Long-Evans Tokushima Fatty (OLETF), an experimental animal

model for obesity and types II DM. Vaspin is a family of serine protease inhibitor. In human, the expression of vaspin found in adipose, gaster, liver and pancreatic tissue. Vaspin also found at the hypothalamus of db/db and C57BL/6 mouse [4].

The increase of serum vaspin concentration associated with obesity, impaired insulin sensitivity, and fitness level, and insulin resistance. Serum vaspin also significantly correlated with leptin, thus support the theory that vaspin associated with body fat mass. However, other studies found no association between serum vaspin with insulin sensitivity or obesity parameters and fat distribution. In one study, serum vaspin levels significantly correlated with fasting insulin, HOMA-IR and ratio of visceral and subcutaneous vaspin expression however, if compared to obese patients with sensitive insulin and resistance after matching with BMI, age and gender, no significant difference of vaspin levels were found in both groups. This suggests that the association between serum vaspin levels, fat distribution and insulin sensitivity is far more complex than expected [5].

According to the data above, to date, the association between the distribution of visceral fat with vaspin serum remains a controversy and their association in type II DM patients remain unclear, hence a study to determine the correlation between visceral fat distribution (measured with waist circumference and visceral fat percentage) with serum vaspin level in type II DM patients is needed.

Methods

This was an observational, analytical cross-sectional study. This study was approved by the Ethics Commission for Research at Medical Faculty of Udayana University, Denpasar Bali. The subjects were 60 type II diabetes mellitus patients who came to Diabetes Center of Sanglah General Hospital, Denpasar Bali. Samples were taken consecutively based on the order of the patients which came to Diabetes Center until minimal sample required achieved.

Table 1: Characteristic of Subjects

No	Variables	Mean	Standard deviation	Unit
1	Vaspin	2.389	3.586	ng/ml
2	Waist circumference	94.95	11.78	Cm
3	Visceral fat percentage	18.05	23.63	%

Each subject was asked to sign an informed consent. The identity of the patients was recorded and followed by physical examination and laboratory examination. History of diabetes, duration of having diabetes, medication history (including diabetic drugs) were asked — physical examination including vital signs, abdominal circumference and visceral fat percentage measurement with bioelectric impedance. Blood samples then collected to measure serum vaspin concentration, performed with "Human/Mouse/rat SERPINA12/Vaspin (Competitive EIA) kit" from Life Span Bio Sciences, Inc. Spearman correlation test was used to analyse the correlation between waist circumference and visceral fat percentage with serum vaspin level since the data were not distributed normally.

Results

Mean vaspin levels in all subjects was 2.389 ± 3.586 ng/ml, mean waist circumference in all subjects was 94.95 ± 11.78 cm and mean visceral fat percentage was 18.05 ± 23.63%.

Table 2: Correlation of Vaspin with Waist Circumference and Visceral Fat Percentage

No	Variables	R	P
1	Waist circumference	-0.044	0.738
2	Visceral fat circumference	-0.103	0.435

No significant correlation was found between vaspin with waist circumference (r = -0.044; p = 0.738) and visceral fat percentage (r = -0.103; p = 0.435).

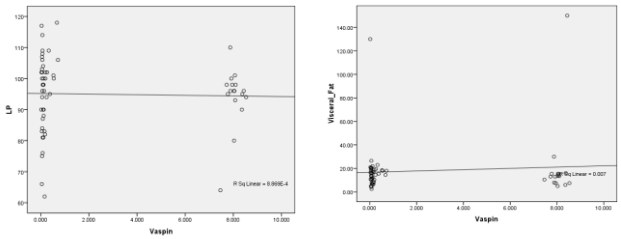

Figure 1: Scatter Plot Correlation between Waist Circumference and Serum Vaspin (left); Scatter Plot Correlation between Visceral Fat Percentage and Vaspin Levels (right)

Discussion

Vaspin (*visceral adipose tissue-derived serine protease inhibitor*) is the most recent adipocytokine exclusively expressed by visceral fat tissue of Otsuka Long-Evans Tokushima Fatty (OLETF) mouse, an experimental animal model for obesity and type II DM. Vaspin is a family of serine protease inhibitor. Serum vaspin concentration decreases significantly along with an increase in age and severe hyperglycemic condition. This process could reduce with insulin therapy or pioglitazone in human, the expression of vaspin found in adipose tissue, gaster, liver, and pancreas. The expression of vaccine also found at the

hypothalamus of db/db and C57BL/6 mouse. The administration of vaspin recombinant on the obese mouse may improve the glucose tolerance and increase insulin sensitivity by affecting the expression of gene candidate for insulin resistance and rapidly decrease food intake [4].

The exact mechanism on how vaspin associated with worsening of glucose homeostasis and insulin sensitivity remains unclear. Based on existing data regarding vaspin mechanism of action, it has been suggested that vaspin inhibit proteases which involved in hormone or molecule degradation which decreased glucose either direct or indirect — the increase of serum vaspin levels associated with obesity, impairment in insulin sensitivity and fitness level. Serum vaspin also significantly correlated with body fat mass. In a female with polycystic ovary syndrome and insulin resistance, the administration of metformin may decrease serum vaspin levels and improve insulin sensitivity.

The result of the current study obtained that mean vaspin levels was 2.389 ± 3.586 ng/ml. This result was higher compared to other studies in Asia. One study in Bangladesh found that mean levels of serum vaspin was 0.83 ± 0.28 ng/ml, while a study in Turkey and China found 0.18 ± 0.10 ng/ml and 0.69 ± 0.31 ng/ml, respectively. These shows that vaspin levels differ in various populations [5].

This study obtained no significant correlation of vaspin with parameters of adipose tissue, e.g., waist circumference can visceral fat percentage. The correlation between vaspin and parameters of adipose tissue remain controversial. Some research found no association between serum vaspin with insulin sensitivity or parameters of obesity and fat distribution. In one study, serum vaspin levels significantly correlated with fasting insulin, HOMA-IR and ratio of visceral and subcutan vaspin expression. However, if compared to insulin-sensitive and insulin-resistance obese patients after matching with BMI, age, and gender, no significant difference was found in both groups. This suggests that the association between serum vaspin levels, fat distribution and insulin sensitivity is far more complex than imagined [5].

The different result was also affected by the type of adipose tissue which produces vaspin. The expression of vaspin mRNA detected at visceral and subcutan adipose tissue. Visceral vaspin mRNA correlated with body mass index, body fat percentage, and plasma glucose levels 2 hours after an oral glucose tolerance test, but not correlated with waist circumference or waist-hip ratio. While subcutaneous vaspin mRNA correlated with the waist-hip ratio, fasting insulin plasma concentration, and glucose delivery. But linear regression analysis showed body fat percentage as the most powerful predictor of visceral vaspin, while insulin sensitivity as the most powerful predictor for subcutaneous vaspin [6]. Visceral and subcutan vaspin were not distinguished in the current study. Thus the relationship between both with adipose tissue parameters could not be depicted through this study.

In conclusion, vaspin did not significantly correlate with waist circumference and visceral fat percentage in diabetes patients. Further study with more samples to determine characteristics of vaspin in various ethnicity and race is needed and differentiate the subcutaneous, and visceral vaspin is needed.

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