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THE ASSOCIATION OF INSULIN RESISTANCE AND LIPID PROFILE RATIO IN METABOLIC SYNDROME

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ABSTRACT

The cause of metabolic syndrome is still not known for sure, but it is suspected that the pathophysiology of metabolic syndrome is associated with insulin resistance and central obesity. Researchers have attempted to evaluate insulin resistance using various serum lipid concentration ratio. This study was to observe the association between insulin resistance and lipid profile ratio using HOMA-IR in metabolic syndrome patients. This study was a cross-sectional that was conducted in Inpatient and Outpatient Adam Malik Hospital during March 2016 - April 2016. Subjects were patients with metabolic syndrome criteria according to the International Diabetic Federation 2005. All samples were examined for their waist circumference, weight, height, blood pressure, insulin, serum glucose, total cholesterol, HDL cholesterol, LDL cholesterol, Triglycerides. Among sixty-six patients in the study 40 (60.6%) were male and 26 (39.4%) female. In this study, there was a significant correlation between HOMA-IR with CT/HDL ratio (r: 0.244 p <0.05); and there was no correlated HOMA-IR, and TG/HDL ratio (r: 0.086 p >0.05) and there was no correlation between HOMA-IR and LDL/HDL (r: 0.336 p > 0.05). There was a significant relationship between insulin resistance and ratio CT/HDL

Key word: HOMA-IR, lipid profile ratio, metabolic syndrome

INTRODUCTION

Metabolic Syndrome (MS) includes central obesity, glucose intolerance or diabetes, hypertension and dyslipidemia with high triglyceride levels and low levels of high-density lipoprotein cholesterol, which has a risk of causing cardiovascular disease.[1,2] Metabolic syndrome is at risk of causing 5-fold diabetes mellitus and twice the risk of cardiovascular disease within the next 5 to 10 years. Metabolic syndrome is a collection of several causative factors that are at risk of cardiovascular disease.[3,4]

Insulin Resistance (IR) is the inability of insulin to give the normal biological effect in certain blood glucose level. If higher insulin level is needed to achieve normal blood glucose it is called IR. Diagnosis of IR may sometimes make it difficult because the type of laboratory studies required to IR is expensive and unavailable in most laboratories in cities of underdeveloped countries. The Homeostatic Model Assessment-Insulin Resistance (HOMA-IR) is more often used to insulin sensitivity because of its cost-effectiveness, practically in large epidemiology researches. HOMA-IR uses blood glucose and fasting insulin for assessing IR and beta-cell function.[5,6]

Recently, studies have actively attempted to evaluate IR utilizing the ratio of various serum lipid concentration levels, such as the total cholesterol/high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C)/HDL-C and triglyceride (TG)/HDL-C Ratio. One of the objectives for clinical practice is to facilitate the application of these criteria for early detection of disease, which is why predictive and prognostic indices of cardiovascular disease have been established such as the triglyceride/HDL-cholesterol (TG/HDL-C) ratio used as a marker of atherogenicity.[7,8] The aimed of this study was to investigate the association of insulin resistance and lipid profile ratio using HOMA-IR in MS patients.

METHODS

This study was cross-sectional. The population of 66 people occording to the criteria of MS IDF 2005 and following the inclusion and exclusion criteria patients. The study was conducted in the Department of Clinical Pathology, Faculty of Medicine, North Sumatera University/Adam Malik Hospital Medan in collaboration with Endocrinology

Division of Department of Internal Medicine, Faculty of Medicine, North Sumatera University/Adam Malik Hospital Medan, from March 2016 until April 2016.

On the patients of laboratory tests such as fasting glucose, fasting insulin, Triglycerides, HDL, LDL, total cholesterol. Measurement of insulin levels using Architect ci4100 (Abbott Laboratories) tool. Measurement of fasting blood sugar levels, TG, HDL, LDL, Total Cholesterol using Architect c8000 (Abbott Laboratories).

The IR index was calculated using relatively simple and highly validated homeostasis model assessment (HOMA-IR) as follow, HOMA-IR = glucose (mg/dL) x insulin (uIU/mL)/405.

Insulin Resistance Correlation (HOMA-IR) with lipid profile ratio used Spearman's test correlation test. All statistical analyses with p <0.05 were considered significant.

RESULTS AND DISCUSSION

This study was 66 patients consisting of males 40 patients (60.6%) and females 26 patients (39.4%) with age range of 44 - 68 years. The results were illustrated in Table 1. Table 1 showed the age of the subjects found the youngest age of 44 and age 68 years. The mean of patients Body Mass Index (BMI) of 31.85 ± 8.62 kg/m^2 subjects which states a condition of obesity and waist circumference (WP) 96.47 ± 6.25 cm. This finding indicated patients suffer from central obesity.

Increased Blood Pressure (BP) of systole and diastole, diastole BP (145.45 ± 14.16) mmHg and systole (89.39 ± 4.9) mmHg. On the subject of MS was found an increase in fasting blood sugar levels (180.14 ± 85.14) and normal insulin levels (11.52 ± 8.9) µIU/mL. The mean of total cholesterol levels (174.35 ± 48.57) mg/dL, LDL (118.15 ± 43.35) mg/dL and triglycerides (144 ± 68.83) mg/dL within normal limits and average low HDL levels (40.02 ± 20.4 2) mg/dL.

In Table 2 the results obtained with the statistical test that HOMA-IR correlated significantly with insulin p: 0.001 and r: 0.571. The HOMA-IR relationship with other patient characteristics data was not statistically significant (p> 0.05).

Table 3 illustrates the results of the statistical tests in this study that HOMA-IR correlated significantly with the ratio of KT/HDL with p: 0.048 and r: 0.244. There was no significant association between HOMA-IR and TG/HDL profile ratio p> 0.05 whereas HOMA-IR with LDL/HDL was positively correlated although statistically had no significant relationship (p> 0.05; r: 0.12).

In this study using IDF criteria, there were found that more males suffered MS as many as 40 people (60.6%) and females as many as 26 people (39.4%). Mostafa reported the prevalence of SM in South Asian males 55% and females 45%. Research in India, Chaudari reported males 50% and females 50%. Soegeondo in Depok stated that the prevalence of SM by 25.7% in males and 25% in females. Vigil in the UK reported the prevalence of male metabolic syndrome 39% and female 61%. This difference may

Table 1. Subject characteristics based on research parameters

	N	MEAN	SD
Age (year)	66	56.59	± 12.323
Waist circumferences (cm)	66	96.47	± 6.25
Weight (kg)	66	83.61	± 12.61
Height (Cm)	66	162.11	± 8.62
Body mass index (kg/m^2)	66	31.85	± 4.55
Diastolic blood pressure (mmHg)	66	145.45	± 14.16
Systolic blood pressure (mmHg)	66	89.39	± 4.92
Insulin (µIU)	66	11.52	± 8.96
Fasting blood glucose (mg/dL)	66	180.14	± 85.14
Total cholesterol(mg/dL)	66	174.35	± 48.57
Triglyceride (mg/dL)	66	144.44	± 68.83
HDL (mg/dL)	66	40.02	± 20.43
LDL (mg/dL)	66	118.15	± 43.25
HOMA-IR	66	5.01	± 3.94
TC/HDL ratio	66	4.78	± 1.50
TG/HDL ratio	66	3.96	± 2.06
LDL/HDL ratio	66	3.22	± 1.30

Table 2. Relationships HOMA-IR with metabolic syndrome elements

	N	p-value	r
Waist circumferences (cm)	66	0.134	0.186
Body mass index (kg/m^2)	66	0.739	0.042
Diastolic blood pressure (mmHg)	66	0.218	0.154
Systolic blood pressure (mmHg)	66	0.947	0.08
Insulin (µIU/mL)	66	0.001*	0.571
Fasting blood glucose (mg/dL)	66	0.492	0.086
Total cholesterol (mg/dL)	66	0.074	0.222
Triglycerides (mg/dL)	66	0.664	0.055
HDL (mg/dL)	66	0.858	-0.22
LDL (mg/dL)	66	0.481	0.88

Table 3. HOMA-IR relationship with lipid profile ratio

	p-value	R
KT/HDL	0.048*	0.244
TG/HDL	0.494	0.086
LDL/HDL	0.336	0.120

P-value< 0.05

be due to differences in culture, lifestyle, andsocioeconomic.[9-11]

Based on Tabata research in Japan and Chaudhari in India there was a positive correlation between IR and WC. The wise circumference had a strong correlation with the amount of abdominal fat and total fatcan also estimate the extent of abdominal obesity approaching deposition. However, this study found no correlation between IR and waist circumference. This result was consistent with Marjani research in Iran and Soegondoin Jakarta.[12,13]

Body mass index cannot accurately describe body composition because IMT cannot distinguish IR and between fat tissue, muscle mass or tissue. In this study there was no correlation between IR and IMT, this finding was in accordance with research Sumner in America and Huguette in Cameroon. This result was in contrast to Hein in China andLaughlinin the UK where there was a correlation between IR and IMT.[14-18]

Insulin resistance is thought to play a role in the occurrence of SM associated with cardiovascular disease. Insulin resistance resulted in endothelial vascular dysfunction which subsequently occurs vasoconstriction and reabsorption of sodium in the kidney resulting in the occurrence of hypertension. The study of Sinsha *et al.,* in Bangladesh and Vangipurapuin in Finland stated there was a correlation between IR with systole and diastole BP. While in this study there was no correlation between IR with systole and diastole BP, but in accordance with research Ku in China.[19-22]

In this study found no significant correlation between IR and insulin levels (r: 0.571 p <0.05) was in accordance with Chu in China and Senthilet. Resistance appears to be defined as the emergence of a biological response/clinical symptom due to increased insulin levels.[23-25]

This was often associated with disruption of tissue sensitivity to glucose-mediated insulin. This was in contrast to Ray *et al.,*research in India and Jung in Korea that there was no correlation between IR and insulin levels.[26,27]

In this study there was no correlation between IR and fasting blood sugar levels, this was similar to Hassan's study. But unlike the Hancox and Jung studies in Korea where there was a correlation between IR and fasting blood sugar levels, it is a condition associated with target organ failure that normally responds to insulin hormone activity. Insulin resistance is also associated with conditions of hypertension, hyperglycemia, and dyslipidemia, a collection of symptoms called metabolic syndrome.[27-31]

In IR there is an increase in the synthesis of hepatic triglyceride, but in physiological conditions more inhibited than increasing the secretion of VLDL to the systemic circulation. Lee and Chu found no correlation between IR and triglyceride levels. But this study found no correlation between IR and triglyceride levels, this is in accordance with Jung research in Korea.[23,27,32]

Another lipid disorder in IR is a decrease in HDL cholesterol, due to a decrease in HDL arrays and metabolism. On the increase of hyper triglyceridemia, decreased cholesterol ester content and lipoprotein core leads to a decrease in HDL cholesterol content by increasing TG into small and solid particles, partly from protein Cholesterol Ester Transfer Function (CETP), causing circulatory

clearance. In this study, there was no correlation between IR and HDL levels found, according to Ray research in India and Jung in Korea different from the Vigil study in Spain. There was a correlation between insulin resistance and HDL levels.[10,11,26,27]

In the Japanese study, there was a significant relationship between IR and the ratio of TG/HDL lipid profile, TC/HDL, LDL/HDL to metabolic syndrome and in healthy people there was a significant relationship between IR only with TG/HDL ratio. In this research, there is a correlation between IR and TC/HDL ratio, and there is no correlation between RI using HOMA-IR with TG/HDL and LDL/HDL ratio, this is in accordance with Chaves research in Mexico and Mohiuddin in Pakistan.[7,33,34]

In this research there is no correlation between IR using HOMA-IR with LP, TD, fasting blood glucose, total cholesterol, LDL and HDL levels, as well as no correlation between insulin resistance (HOMA-IR) and TG/HDL ratio also the LDL/HDL ratio. These result may be attributed to our cross-sectional study in which the data were collected only once at a time, so only to see the correlation between these variable variables. Other risk factors that may affect the results of the study are not further analyzed in this study such as family history with the similar disease, physical activity and energy balance and analysis of food intake including carbohydrate and fat sources and whether or not consuming drugs.

CONCLUSIONS AND SUGGESTIONS

There was a significant correlation between insulin resistance (HOMA-IR) with CT/HDL ratio. There was a significant correlation between insulin resistance with insulin levels. There was no correlation between insulin resistance (HOMA-IR) and TG/HDL profile ratio. There was no correlation between HOMA-IR and LDL/HDL ratio.

Further research is needed by analyzing other factors that can affect insulin levels, fasting glucose and lipid profile.

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