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ORIGINAL ARTICLE

Association between Anthropometric Measurements and Metabolic Syndrome in Office Workers in Trisakti University: A Cross-Sectional Study

Hubungan Antropometri dengan Sindrom Metabolik pada Pekerja Kantor di Universitas Trisakti: Studi Potong Lintang

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ABSTRACT

Background

Metabolic syndrome is a disease with an increasing prevalence and a high health burden. Most individuals with metabolic syndrome have a sedentary lifestyle, such as office workers who rarely undergo health check-ups. Therefore, this study aims to investigate the profile and correlation of anthropometric indices and metabolic syndrome parameters among office workers at Trisakti University.

Methods

Office workers from the Faculty of Medicine, Trisakti University, were recruited for this study, and informed consent was obtained. Subsequently, data on blood pressure, laboratory tests including glucose levels and lipid profiles, as well as anthropometric measurements such as weight, height, body mass index (BMI), waist circumference, and hip circumference were collected. The data were statistically analyzed using univariate analysis and bivariate correlation analysis with Spearman's test, as well as intergroup difference tests using the Kruskal-Wallis test and ANOVA.

Results

The average age of the subjects was 41.46±9.87 years. The data showed that approximately 43.33% had hypertension, with a concentration of data in the profiles of grade I obesity, normotension, normal triglyceride levels, normal blood glucose levels, and normal high-density lipoprotein (HDL) levels. The analysis revealed a significant difference in HDL levels between the normal BMI group and the overweight BMI group (MD: 9.534; 95% CI: 1.68-17.39; p = 0.018). A very weak and non-significant correlation was found between BMI and metabolic syndrome parameters.

Conclusions

Anthropometric indices reflect central obesity as well as the characteristics of metabolic syndrome among employees at the Faculty of Medicine, Trisakti University.

Keywords: Anthropometry; Metabolic syndrome; Office worker.

ABSTRAK

Latar Belakang

Sindrom metabolik merupakan penyakit dengan prevalensi yang terus meningkat dan beban kesehatan yang tinggi. Sebagian besar penderita sindrom metabolik merupakan individu dengan gaya hidup sedenter seperti pekerja kantor yang jarang melakukan pemeriksaan kesehatan. Oleh karena itu, penelitian ini bertujuan untuk menyelidiki profil dan korelasi indeks antropometri dan parameter sindrom metabolik pada pekerja kantor di Universitas Trisakti.

Metode

Subjek penelitian berupa pekerja kantor Fakultas Kedokteran (FK) Universitas Trisakti direkrut dan diperoleh persetujuan informasi untuk studi ini. Kemudian subyek diambil data tekanan darah, pemeriksaan laboratorium berupa kadar glukosa dan profil lipid serta diukur data antropometrinya berupa berat badan, tinggi badan, indeks massa tubuh (IMT), lingkar pinggang dan lingkar pinggul. Data dianalisis secara statistik dengan analisis univariat dan analisis bivariat korelasi menggunakan uji Spearman serta uji perbedaan antarkelompok menggunakan uji Kruskal-Wallis dan ANOVA.

Hasil

Rata-rata usia subjek adalah 41.46±9.87 tahun. Data subjek menunjukkan sekitar 43.33% memiliki hipertensi, pemusatan data pada profil obesitas tingkat I, profil normotensi, profil normal kadar trigliserida, profil normal kadar gula darah, dan profil normal kadar high-density lipoprotein (HDL). Analisis menunjukkan perbedaan bermakna terhadap kadar HDL pada kelompok IMT normal dan IMT berlebih (MD: 9.534; IK 95%: 1.68-17.39; p=0.018). Korelasi sangat lemah yang tidak signifikan didapat antara IMT dan parameter sindrom metabolik.

Kesimpulan

Indeks antropometri menggambarkan obesitas secara umum dan obesitas sentral serta karakteristik sindrom metabolik pada karyawan FK Trisakti.

Kata Kunci: Antropometri; Sindrom metabolik; Pekerja kantor.

INTRODUCTION

The prevalence of metabolic syndrome is increasing globally. Metabolic syndrome has been shown to increase the occurrence of degenerative diseases, such as cardiovascular disease. The prevalence of metabolic syndrome varies between populations with different ethnicities. It is estimated that 12-37% of the Asian population and 12-26% of the European population suffer from metabolic syndrome.[1] Hypertension is a major contributor to the prevalence of metabolic syndrome, and abdominal adiposity is more strongly associated with metabolic syndrome than overall adiposity.[2] Overweight people have a 5.54 times greater risk of developing metabolic syndrome compared to those with a normal body mass index, while obesity has a 7.44 times greater risk of developing metabolic syndrome compared to those with a normal BMI.[3]

The diagnosis of metabolic syndrome requires invasive laboratory measurements to determine plasma lipid profiles and glycemic status. These measurements are relatively expensive. The beneficial effects of weight loss on various components of metabolic syndrome have been shown to reduce cardiovascular mortality. Therefore, the use of several anthropometric indices to assess central obesity as a non-invasive method can help to estimate the risk of developing metabolic syndrome.[4]

Anthropometric indices, such as waist circumference, which reflects abdominal adiposity, are commonly used in metabolic syndrome screening. The selection of waist circumference as a tool to determine metabolic syndrome is based on its association with cardio-metabolic risk in the United States and Western European populations.[5] The use of waist circumference alone for metabolic syndrome screening may have limitations because individuals with the same waist circumference do not necessarily share the same health risks, which can also depend on their height. For example,

in Japanese people, short men show higher health risks compared to tall men with similar waist circumference.[6] In addition, subcutaneous adipose tissue mass has been shown to contribute independently and synergistically to cardiovascular disease pathology, along with visceral fat.[7] Thus, a simple waist circumference measurement to indicate visceral adiposity does not reflect all predictions of cardiovascular disease risk associated with anthropometric factors. The waist-to-height ratio (WHRR) is measured by comparing the results of waist circumference measurements and height. The value determined for a large WHRR is >0.5, while for a small WHRR, the value determined is <0.5. Ashwell (2009) reported that 0.5 is the limit used as an indication of the risk of health problems associated with body fat levels.[8].

METHODS

This study is an observational analytical study with a cross-sectional method with a population of men and women aged 20-60 years who are employees of the Faculty of Medicine, Trisakti University. The sample consisted of 60 people taken using a random sampling technique. Data collection was carried out at the Trisakti Medical Faculty campus in February 2024. The inclusion criteria were men and women aged > 20 years when the study was conducted and were willing to be included in the study and the exclusion criteria were respondents diagnosed with the following diseases: diabetes mellitus, cancer, kidney disease, liver disease, gastrointestinal diseases that require a special diet, physical or mental disabilities, pregnant women and taking steroid drugs. The selected subjects were asked to fast for at least 10 hours before their blood was taken. Then the subjects' blood pressure data were taken, laboratory tests in the form of glucose levels and lipid profiles, and their anthropometric data were measured in the form of weight, height, waist circumference, and hip circumference. From the anthropometric data, the body mass index, the ratio of waist circumference and height, and the ratio of waist circumference and hip circumference were then calculated. From the data obtained, sample characteristics data in the form of general obesity status and central obesity, blood pressure characteristics, and characteristics of fasting blood glucose lab results and lipid profiles, in this case, triglyceride levels and HDL levels. The statistical test to be performed is univariate analysis to describe the characteristics of each variable against gender, age, anthropometric index, and metabolic syndrome component parameters. Bivariate analysis is used to determine whether or not there is a relationship between the independent and dependent variables, namely anthropometric indices with metabolic syndrome components (blood pressure, blood sugar levels, cholesterol levels, HDL levels, triglyceride levels). The normalization test is performed using the Shapiro-Wilk test on each dataset to determine whether the data is normally distributed or not. The Kruskal-Wallis and ANOVA tests are performed to test the differences between BMI groups against metabolic syndrome parameters. The correlation test between the independent and dependent variables uses the Spearman correlation test with a significance level of p <0.05.

RESULTS

Univariate Analysis

Characteristics

In this study, there were 60 research subjects with 17 male subjects and 43 female subjects. The mean age of all research subjects was 41.46 ± 9.87 years with a mean age of men 39.79 ± 8.85 years and a mean age of women 45.82 ± 11.20 years. The research subjects had a median BMI of 27.19 (16.1-46.93) kg/m2, mean RLPLP 0.86 ± 0.07, mean RLPTB 0.58 ± 0.07, median blood sugar level 92.5 (71-298) mg/dL, median triglyceride level 106 (57-651) mg/dL, and mean HDL level 55.87 ± 12.81. Complete demographics of the research subjects can be seen in Table 1.

Table 1. Demographics of research subjects and results of metabolic syndrome parameter measurements.

Variable	Male (n=17)	Female (n=43)	All (n=60)
Age (year)	39.79±8.85	45.82±11.20	41.46±9.87
BMI (kg/m^2)	25.72 (18.11-38.64)	27.79 (16.1-46.93)	27.19 (16.1-46.93)
WBC/WC	0.90±0.07	0.84±0.06	0.86±0.07
WBC/HB	0.56±0.08	0.59±0.07	0.58±0.07
Blood Glucose Level (mg/dL)	102 (82-165)	91 (71-298)	92.5 (71-298)
Triglyceride levels (mg/dL)	122 (81-493)	102 (57-651)	106 (57-651)
HDL levels (mg/dL)	48.71±8.31	58.70±13.24	55.87±12.81

Note: HDL, *high-density lipoprotein*; BMI, body mass index; WBC/WC, waist/hip ratio; WBC/HB, waist/height ratio.

A total of 26 research subjects had high blood pressure, and 34 research subjects had normal blood pressure. In the central obesity parameter, a total of 41 research subjects had large WBC/HB and 19 research subjects had normal WBC/HB, while there were 30 research subjects that had large WBC/WC and 30 research subjects had normal WBC/WC. Table 2 shows the characteristics of research subjects based on blood pressure, WBC/HB, and WBC/WC.

Table 2. Subject characteristics based on blood pressure, WBC/HB, and WBC/WC.

Variable	High blood pressure (systolic≥140 mmHg/diastolic≥ 90 mmHg)	Normal blood pressure (systolic <140 mmHg/diastolic <90 mmHg)	WBC/HB Large (>0,5)	WBC/HB normal (≤0,5)	WBC/WC Large (>0,5)	WBC/WC normal (≤0,5)
Male (n(%))	6 (10)	11 (18.33)	3 (5)	14 (23.3)	9 (15)	8 (13.3)
Female (n(%))	20 (33.33)	23 (38.33)	38 (63.3)	5(8.3)	21(35)	22(36.7)
Total (n(%))	26 (43.33)	34 (56.66)	41(68.3)	19(31.6)	30(50)	30(50)

Note: WBC/HB: waist circumference/height ratio; RLP/LP: waist circumference/hip circumference ratio.

Bivariate Analysis

Table 3 shows the distribution of blood pressure measurement results against BMI, WBC/WC, and WBC/HB. The distribution of research subjects with hypertension did not show significant differences between the normal, overweight, and obese BMI groups; normal and obese WBC/WC; and normal and obese WBC/HB. When viewed from the research subjects with hypertension from the obesity group to the other groups, there were more hypertensive subjects in the obesity group based on WBC/WC and WBC/HB than BMI.

Table 3. Distribution of blood pressure measurement results against BMI, WBC/WC, and WBC/HB using Chi-Square

Variable		Blood pressure Normotensi	Hypertension	p
BMI	Normal	10	7	0.949*
	Berlebih	13	11	
	Obesity	11	8	
WBC/WC	Normal	17	11	0.609*
	Obesity	17	15	
WBC/HB	Normal	6	2	0.446*
	Obesity	28	24	

***** Chi-square statistical test

Note: BMI: body mass index; WBC/WC: waist/hip ratio; WBC/HB: waist/height ratio.

Table 4 shows the median results of blood sugar, triglyceride, and HDL measurements in the normal, overweight, and obese BMI groups, normal and obese BMI/LP, and normal and obese BMI/TB. In each BMI group, there was no significant difference between the normal, overweight, and obese BMI groups. However, the higher BMI group had higher blood sugar and triglyceride levels and lower HDL levels. When viewed from BMI to blood pressure, the normal, overweight, and obese BMI groups did not have a significant difference in blood pressure (p = 0.956). In statistical testing with the ANOVA test for HDL levels with normal data distribution (table 5), the results showed that the normal BMI group had higher HDL levels than the overweight BMI group (mean difference [MD]: 9.534; 95% confidence interval [CI]: 1.68-17.39; p = 0.018) with a significant difference. When viewed from the WBC/WC and WBC/HB, statistical testing did not show any significant differences between the groups with normal and obese WBC/WC and WBC/HB.

Table 4. Results of the Kruskal-Wallis Test Measurement of blood sugar, triglyceride, and HDL levels in various BMI, WBC/WC, and WBC/HB groups.

Variable		Blood sugar levels	p	Triglyceride levels	p	HDL levels	p
IMT	Normal	90 (82-149)		106 (57-493)		63 (39-89)	
	Berlebih	95 (71-298)	0.801	101.5 (73-651)	0.751	51 (31-78)	0.051*
	Obesitas	93 (80-136)		114 (67-206)		55 (40-81)	
WBC/WC	Normal	92.5 (77-149)		111 (67-233)		55 (38-78)	
	Obesitas	92 (71-298)	0.906	100 (57-651)	0.366	55.5 (31-89)	0.836*
WBC/HB	Normal	89.5 (82-106)		100 (61-164)		66 (45-79)	
	Obesitas	93.5 (71-298)	0.191	108 (57-651)	0.618	55 (31-89)	0.066*

***** Kruskal-Wallis statistical test

Note: HDL: high-density lipoprotein; BMI: body mass index; WBC/HB: waist/height ratio; WBC/WC: waist/hip ratio.

Tabel 5. Hasil uji ANOVA kadar HDL pada berbagai kelompok IMT.

BMI	Normal	Over	Obesity
Normal		MD: 9.534; IK 95%: 1.68-17.39; p=0.018	MD: 7.697; IK 95%: -0.58-15.97; p=0.068
Over	MD: -9.534; IK 95%; -17.39 - -1.68; p=0.068		MD: -1.838; IK 95%: -9.45 – 5.77; p=0.63
Obesity	MD: -7.697; IK 95%: -15.97 – 0.58; p=0.068	MD: 1.838; IK 95%: -5.77 – 9.45; p=0.63	

Note: CI: confidence interval; BMI:body mass index; MD:mean difference.

The correlation was positive and very weak in BMI against blood pressure (r=0.005), blood sugar levels (r=0.001), and triglyceride levels (r=0.085). The correlation of BMI against HDL levels was found to be a weak negative correlation (r=-0.227). Not much different, a very weak positive correlation was found between WBC/WC with blood pressure (r=0.076) and HDL levels (r=0.045). A very weak negative correlation was found in WBC/WC against blood sugar levels (r=-0.015) and triglycerides (r=-0.018). A very weak positive correlation was also found in WBC/HB with blood pressure (r=0.145), blood sugar levels (r=0.170), and triglyceride levels (r=0.065). A weak negative correlation was found between WBC/HB with HDL levels (r=-0.239, p=0.065). However, the correlation did not show significant results between BMI, WBC/WC, and WBC/HB with metabolic syndrome parameters, including blood pressure, blood sugar levels, triglyceride levels, and HDL levels (Table 6).

Table 6. Spearman correlation results of BMI, WBC/WC, and WBC/HB on blood sugar levels, triglyceride levels, and HDL levels.

Correlation test	Blood pressure	Blood sugar levels	Triglyceride levels	HDL Levels
Body mass index (BMI)	r=0.005; p=0.969	r=0.001; p=0.993	r=0.085; p=0.518	r=-0.227; p=0.082
WBC/WC	r=0.076; p=0.562	r=-0.015; p=0.907	r=-0.118; p=0.370	r=0.045; p=0.731
WBC/HB	r=0.145; p=0.269	r=0.17; p=0.194	r=0.065; p=0.621	r=-0.239; p=0.065

***** Spearman correlation statistical test

HDL: high-density lipoprotein; BMI: body mass index; WBC/HB: waist circumference/height ratio; WBC/WC: waist circumference/hip circumference ratio

DISCUSSION

The components of metabolic syndrome include a large waist circumference, hypertriglyceridemia, low high-density lipoprotein (HDL) cholesterol, hypertension, and hyperglycemia.[9,10] The diagnosis of metabolic syndrome can be made when 3 of the 5 components are met. Because of this, obesity is one of the prominent components in patients with metabolic syndrome.10 Thus, individuals with obesity are of particular concern for the incidence of metabolic syndrome.[9-11]

Body Mass Index (BMI) is a popular diagnostic tool used to classify obesity because it is easy and inexpensive, only measuring weight and height, although BMI cannot accurately measure body composition.[12,13] Normal BMI has a lower risk of metabolic syndrome, which ultimately reduces the risk of morbidity and mortality due to metabolic syndrome.[12,14]

From this study, the results obtained were 17 people (28.3%) who were in the normal body mass index category, 26 people (43.3%) who were overweight, and 19 people (31.7%) who were obese. In addition, the centralization of BMI data was in grade I obesity. These findings imply that the BMI of office workers at Trisakti Medical Faculty is obese and at risk of developing metabolic syndrome.

The amount of fat in the abdomen indicates several metabolic changes, including insulin resistance and increased production of free fatty acids, compared to the amount of subcutaneous fat on the legs and arms.[15] Metabolic changes provide an overview of the examination of diseases related to differences in body fat distribution. 15,16 More sensitive measures to assess central obesity are the waist-to-height ratio (WBC/HB) and the waist-to-hip ratio (WBC/WC).[15,17-19] The WBC/HB value limit is 0.5 and can be used in all genders and all races for both children and adults. [20] From this study, more than half of the respondents were in the large WBC/HB category, namely 41 people (68.3%). The remaining 19 people (31.72%) were in the normal category. More female respondents were in the large WBC/HB criteria, namely 38 people (63.3%). Another parameter that is considered sensitive to assess central obesity is the ratio between waist circumference and hip circumference (WBC/WC). Based on WHO criteria, WBC/WC is categorized as central obesity for men is >0.90 and women >0.85.[20] The results of the study obtained balanced values between the two, namely 50% for large WBC/WC and 50% for the normal WBC/WC category, where more female respondents were categorized as central obesity, namely 21 people (35%).

Hypertension is a component that is also included in metabolic syndrome. According to WHO, blood pressure (BP) is categorized as high if systolic BP> 140 mmHg and/or diastolic BP> 90 mmHg. Sigit et al (2020) stated that Indonesian women suffer more from metabolic syndrome than men.[2] This is following the results of the current study, namely that hypertension in women (33.3%) is more than in men, which is only 10%. Overall, 34 people (56.7%) were in the normal BP category, and the remaining 26 people (43.3%) were in the high BP category. These findings also show that quite

a lot of research subjects with hypertension are also components and risk factors for metabolic syndrome. The statistical results showed no significant difference in hypertension parameters against anthropometric measurements (BMI, WBC/WC, and WBC/HB). This happened because the concentration of the subject's blood pressure data was at normotension. From these findings, it can be concluded that the office worker research subjects had just experienced obesity and had not progressed to metabolic syndrome, such as hypertension. Studies have shown that central obesity is the beginning of the onset of metabolic syndrome by contributing to insulin resistance in individuals.[21]

Insulin resistance is one of the parameters in metabolic syndrome. The occurrence of insulin resistance, such as in cases of diabetes mellitus and metabolic syndrome, will result in abnormal fasting blood glucose levels. According to the WHO, abnormal fasting blood glucose levels are when the results are above 100 mg/dL. The fasting blood glucose levels of the study subjects showed that 10 people (16.7%) were included in the abnormal level category for fasting blood glucose. The remaining 50 people (83.3%) were in the normal blood sugar category. The fasting blood glucose levels in the findings were still within normal limits, with a few study subjects having abnormal levels. However, this does not rule out the possibility of insulin resistance that begins to occur in individuals with obesity.[22]

Triglyceride levels are one of the components that meet the criteria for metabolic syndrome. Based on the criteria from the World Health Organization (WHO) and the International Diabetes Federation (IDF) for triglyceride levels are 150 mg/dl.[15] The results of the examination showed that 13 subjects (21.7%) were included in the high triglyceride level category. The remaining 47 subjects were included in the normal triglyceride level category.

HDL cholesterol levels have the effect of reducing the risk of atherosclerosis of blood vessels, including one of the criteria for metabolic syndrome. Based on WHO criteria, the limit value of HDL levels is different for men and women. HDL is categorized as metabolic syndrome for men if the level is <40 mg/dl. While for women, if the HDL level is <50 mg/dl.[12] The results of the study showed that most of them were in the high HDL category, namely 57 people (95%). The remaining 3 people were in the low HDL category. The normal BMI group had higher HDL levels than the excessive BMI group with a significant difference (MD: 9,534; 95% CI: 1.68-17.39; p = 0.018). These results indicate that HDL levels are likely to be the first change in the increase in BMI in individuals.[12]

CONCLUSION

From the research, data on the characteristics of anthropometric indices were obtained that describe general obesity and central obesity, as well as the characteristics of the components of metabolic syndrome in FK Trisakti employees. To assess the relationship between the anthropometric index and the components of metabolic syndrome, it is necessary to continue with appropriate statistical tests as mentioned above.

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AUTHORS CONTRIBUTION

Study conception, design: AT, DN, CS, MS; data collection: AT, DN, CS, KM, LP, analysis, interpretation of results, manuscript preparation: AT, DN, CS, MS, KM, LP; All authors reviewed the results and approved the final version of the manuscript.

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CONFLICT OF INTEREST

In this study, no conflict of interest was found.

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Association between Anthropometric Measurements and Metabolic Syndrome in Office Workers in Trisakti University: A Cross-Sectional Study

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Abstrack

Background Metabolic syndrome is a disease with an increasing prevalence and a high health burden. Most individuals with metabolic syndrome have a sedentary lifestyle, such as office workers who rarely undergo health check-ups. Therefore, this study aims to investigate the profile and correlation of anthropometric indices and metabolic syndrome parameters among office workers at Trisakti University.

Method Office workers from the Faculty of Medicine, Trisakti University were recruited for this study, and informed consent was obtained. Subsequently, data on blood pressure, laboratory tests including glucose levels and lipid profiles, as well as anthropometric measurements such as weight, height, body mass index (BMI), waist circumference, and hip circumference were collected. The data were statistically analyzed using univariate analysis and bivariate correlation analysis with Spearman's test, as well as intergroup difference tests using the Kruskal-Wallis test and ANOVA.

Results The average age of the subjects was 41.46±9.87 years. The data showed that approximately 43.33% had hypertension, with a concentration of data in the profiles of grade I obesity, normotension, normal triglyceride levels, normal blood glucose levels, and normal high-density lipoprotein (HDL) levels. The analysis showed a significant difference in HDL levels between the normal BMI group and the overweight BMI group (MD: 9.534; 95% CI: 1.68-17.39; p=0.018). A very weak and non-significant correlation was found between BMI and metabolic syndrome parameters.

Conclusion Anthropometric indices reflect central obesity as well as the characteristics of metabolic syndrome among employees at the Faculty of Medicine, Trisakti University.

Keywords: anthropometry, metabolic syndrome, office worker

Abstrak

Latar Belakang : Sindrom metabolik merupakan penyakit dengan prevalensi yang terus meningkat dan beban kesehatan yang tinggi. Sebagian besar penderita sindrom metabolik merupakan individu dengan gaya hidup sedenter seperti pekerja kantor yang jarang melakukan pemeriksaan kesehatan. Oleh karena itu, penelitian ini bertujuan untuk menyelidiki profil dan korelasi indeks antropometri dan parameter sindrom metabolik pada pekerja kantor di Universitas Trisakti.

Metode : Subjek penelitian berupa pekerja kantor Fakultas Kedokteran (FK) Universitas Trisakti direkrut dan diperoleh persetujuan informasi untuk studi ini. Kemudian subyek diambil data tekanan darah, pemeriksaan laboratorium berupa kadar glukosa dan profil lipid serta diukur data antropometrinya berupa berat badan, tinggi badan, indeks massa tubuh (IMT), lingkar pinggang dan lingkar pinggul. Data dianalisis secara statistik dengan analisis univariat dan analisis bivariat korelasi menggunakan uji Spearman serta uji perbedaan antarkelompok menggunakan uji Kruskal-Wallis dan ANOVA.

Hasil : Rata-rata usia subjek adalah 41,46±9,87 tahun. Data subjek menunjukkan sekitar 43,33% memiliki hipertensi, pemusatan data pada profil obesitas tingkat I, profil normotensi, profil normal kadar trigliserida, profil normal kadar gula darah, dan profil normal kadar high-density lipoprotein (HDL). Analisis menunjukkan perbedaan bermakna terhadap kadar HDL pada kelompok IMT normal dan IMT berlebih (MD: 9,534; IK 95%: 1,68-17,39; p=0,018). Korelasi sangat lemah yang tidak signifikan didapat antara IMT dan parameter sindrom metabolik.

Kesimpulan Indeks antropometri menggambarkan obesitas secara umum dan obesitas sentral serta karakteristik sindrom metabolik pada karyawan FK Trisakti.

Keywords: *antropometri, sindrom metabolik, pekerja kantor*

Pendahuluan

Prevalensi sindrom metabolik meningkat secara global. Sindrom metabolik terbukti meningkatkan terjadinya penyakit degeneratif, seperti penyakit kardiovaskular. Prevalensi sindrom metabolik bervariasi antar populasi dengan etnis yang berbeda. Diperkirakan bahwa 12-37% populasi Asia dan 12 – 26% populasi Eropa menderita sindrom metabolik.[1] Hipertensi merupakan kontributor utama prevalensi sindrom metabolik dan adipositas perut lebih terkait kuat dengan sindrom metabolik dibandingkan adipositas keseluruhan.[2] Berat badan berlebih mempunyai risiko 5,54 kali lebih besar untuk mengalami sindrom metabolik dibandingkan dengan indeks massa tubuh normal, sedangkan obesitas berisiko menderita sindrom metabolik 7,44 kali lebih besar dibandingkan dengan IMT normal.[3]

Diagnosis sindrom metabolik memerlukan pengukuran laboratorium invasif untuk menentukan profil lipid plasma dan status glikemik. Pengukuran ini relatif mahal.

Efek menguntungkan dari penurunan berat badan pada berbagai komponen sindrom metabolik telah terbukti mengurangi angka kematian akibat penyakit kardiovaskular. Sehingga penggunaan beberapa indeks antropometri untuk menilai adanya obesitas sentral sebagai metode non invasif dapat membantu untuk memperkirakan risiko kemungkinan terjadinya sindrom metabolik.[4]

Indeks antropometri seperti lingkar pinggang yang mencerminkan adipositas perut biasanya digunakan dalam pemeriksaan metabolic sindrom. Pemilihan lingkar pinggang sebagai alat menentukan sindrom metabolik didasarkan pada hubungannya dengan resiko kardio metabolic di Amerika Serikat dan populasi Eropa Barat.[5] Penggunaan lingkar pinggang saja untuk skrining metabolic sindrom mungkin memiliki keterbatasan karena orang dengan lingkar pinggang yang sama belum tentu memiliki resiko kesehatan yang sama, yang mungkin juga bergantung pada tinggi badan mereka. Misalnya pada orang Jepang, laki-laki pendek menunjukkan resiko kesehatan yang lebih tinggi dibandingkan dengan laki-laki tinggi yang mempunyai lingkar pinggang serupa.[6] Selain itu, massa jaringan adiposa subkutan telah terbukti berkontribusi secara independen dan sinergis dengan lemak visceral terhadap patologi penyakit kardiovaskular.[7] Dengan demikian, pengukuran lingkar pinggang sederhana untuk menunjukkan adipositas visceral tidak mencerminkan semua prediksi resiko penyakit kardio vascular yang terkait dengan factor antropometrik. Rasio lingkar pinggang-tinggi badan (RLPTB) diukur dengan membandingkan hasil pengukuran lingkar pinggang dan tinggi badan. Nilai yang ditentukan untuk RLPTB besar adalah > 0,5, sedangkan untuk RLPTB kecil nilai yang ditentukan < 0,5. Ashwell (2009) melaporkan bahwa 0,5 merupakan batas yang dipakai sebagai indikasi adanya risiko masalah kesehatan yang berkaitan dengan kadar lemak tubuh.[8]

Metode

Penelitian ini merupakan penelitian analitik observasional dengan metode cross sectional dengan populasi adalah laki-laki dan perempuan usia 20 – 60 tahun yang merupakan karyawan Fakultas Kedokteran Universitas Trisakti. Sampel berjumlah 60 orang yang diambil dengan teknik random sampling. Pengambilan data di lakukan di kampus FK Trisakti pada bulan Februari 2024. Kriteria inklusi adalah laki-laki dan perempuan usia > 20 tahun saat dilakukan penelitian dan bersedia diikutsertakan pada

penelitian dan kriteria eksklusi adalah responden yang didiagnosis menderita penyakit berikut ini: diabetes mellitus, kanker, penyakit ginjal, penyakit hati, penyakit gastrointestinal yang memerlukan diet khusus, cacat fisik atau mental, wanita hamil dan mengkonsumsi obat steroid. Subyek yang dipilih diminta puasa minimal 10 jam sebelum diambil darahnya. Kemudian subyek diambil data tekanan darah, pemeriksaan laboratorium berupa kadar glukosa dan profil lipid serta diukur data antropometrinya berupa berat badan, tinggi badan,lingkar pinggang dan lingkar pinggul. Dari data antropometri kemudian dihitung indeks massa tubuh, rasio lingkar pinggang dan tinggi badan serta rasio lingkar pinggang dan lingkar pinggul. Dari data tersebut didapatkan data karakteristik sampel berupa status obesitas secara umum dan obesitas sentral, karakteristik tekanan darah serta karakteristik hasil lab glukosa darah puasa dan profil lipid, dalam hal ini kadar trigliserida dan kadar HDL. Uji statistik yang akan dilakukan adalah analisis univariat untuk mendeskripsikan karakteristik dari setiap variabel terhadap jenis kelamin, usia, indeks antropometri, dan parameter komponen sindrom metabolik. Analisis bivariat digunakan untuk menentukan ada atau tidaknya hubungan antara variabel bebas dan variabel tergantung, yaitu indeks antropometri dengan komponen sindrom metabolik (tekanan darah, kadar gula darah, kadar kolesterol, kadar HDL, kadar trigliserida). Uji normalitasi dilakukan dengan tes Shapiro-Wilk pada setiap data untuk mengetahui apakah data berdistribusi normal atau tidak. Uji Kruskal-Wallis dan ANOVA dilakukan untuk uji perbedaan antarkelompok IMT terhadap parameter sindrom metabolik. Uji korelatif antara variabel bebas dan terikat menggunakan uji korelasi Spearman dengan tingkat kemaknaan $p < 0,05$.

Hasil

A. Analisis Univariat

1. Karakteristiks Univariat

Pada penelitian ini terdapat 60 subjek penelitian dengan 17 subjek laki-laki dan 43 subjek perempuan. Mean usia keseluruhan subjek penelitian adalah 41,46±9,87 tahun dengan mean usia laki-laki 39,79±8,85 tahun dan mean usia perempuan 45,82±11,20 tahun. Subjek penelitian memiliki median IMT 27,19 (16,1-46,93) kg/m^2, mean RLPLP 0,86±0,07, mean RLPTB 0,58±0,07, median kadar gula darah 92,5 (71-298) mg/dL, median kadar

trigliserida 106 (57-651) mg/dL, dan mean kadar HDL 55,87±12,81. Demografi lengkap subjek penelitian dapat dilihat pada tabel 1.

Tabel 1. Demografi subjek penelitian dan hasil pengukuran parameter sindrom metabolik.

Variabel	Laki-laki (n=17)	Perempuan (n=43)	Semua (n=60)
Usia (tahun)	39,79±8,85	45,82±11,20	41,46±9,87
IMT (kg/m^2)	25,72 (18,11-38,64)	27,79 (16,1-46,93)	27,19 (16,1-46,93)
RLP/LP	0,90±0,07	0,84±0,06	0,86±0,07
RLP/TB	0,56±0,08	0,59±0,07	0,58±0,07
Kadar gula darah (mg/dL)	102 (82-165)	91 (71-298)	92,5 (71-298)
Kadar trigliserida (mg/dL)	122 (81-493)	102 (57-651)	106 (57-651)
Kadar HDL (mg/dL)	48,71±8,31	58,70±13,24	55,87±12,81

Catatan: HDL, *high-density lipoprotein*; IMT, indeks massa tubuh; RLP/LP, rasio lingkar pinggang/lingkar pinggul; RLP/TB, rasio lingkar pinggang/tinggi badan.

Sebanyak 26 subjek penelitian memiliki tekanan darah tinggi dan 34 subjek penelitian memiliki tekanan darah normal. Pada parameter obesitas sentral, sebanyak 41 subjek penelitian memiliki RLP/TB besar dan 19 subjek penelitian memiliki RLP/TB normal, sedangkan terdapat 30 subjek penelitian memiliki RLP/LP besar dan 30 subjek penelitian memiliki RLP/LP normal. Tabel 2 menunjukkan karakteristik subjek penelitian berdasarkan tekanan darah, RLP/TB, dan RLP/LP.

Tabel 2. Karakteristik subjek penelitian berdasarkan tekanan darah, RLP/TB, dan RLP/LP.

Variabel		Tekanan darah tinggi (sistol≥140 mmHg/diastol≥ 90 mmHg)	Tekanan darah normal (sistol<140 mmHg/diastol< 90 mmHg)	RLP/ TB besar (>0,5)	RLP/ TB normal (≤0,5)	RLP/ LP besar (>0,5)	RLP/ LP normal (≤0,5)
Laki-laki	n	6	11	3	14	9	8
	%	10	18,33	5	23,3	15	13,3
Perempuan	n	20	23	38	5	21	22
	%	33,33	38,33	63,3	8,3	35	36,7
Total	n	26	34	41	19	30	30
	%	43,33	56,66	68,3	31,6	50	50

Catatan: RLP/TB, rasio lingkar pinggang/tinggi badan; RLP/LP, rasio lingkar pinggan/lingkar panggul.

B. Analisis Bivariat

Tabel 3 menunjukkan distribusi hasil pengukuran tekanan darah terhadap IMT, RLP/LP, dan RLP/TB. Distribusi subjek penelitian dengan hipertensi tidak menunjukkan perbedaan bermakna antara kelompok IMT normal, berlebih, dan obesitas; RLP/LP normal dan obesitas; serta RLP/TB normal dan obesitas. Bila dilihat subjek penelitian dengan hipertensi dari kelompok obesitas terhadap kelompok lainnya, subjek hipertensi lebih banyak pada kelompok obesitas berdasarkan RLP/LP dan RLP/TB daripada IMT.

Tabel 3. Distribusi hasil pengukuran tekanan darah terhadap IMT, RLP/LP, dan RLP/TB.

Variabel		Tekanan darah	
		Normotensi	Hipertensi
IMT	Normal	10	7
	Berlebih	13	11
	Obesitas	11	8
Nilai p		0,949	
RLP/LP	Normal	17	11
	Obesitas	17	15
Nilai p		0,609	
RLP/TB	Normal	6	2
	Obesitas	28	24
Nilai p		0,446	

Catatan: IMT, indeks massa tubuh; RLP/LP, rasio lingkar pinggang/lingkar pingggul; RLP/TB, rasio lingkar pinggang/tinggi badan.

Tabel 4 menunjukkan median hasil pengukuran kadar gula darah, trigliserida, dan HDL pada kelompok IMT normal, berlebih, dan obesitas, RLP/LP normal dan obesitas, serta RLP/TB normal dan obesitas. Pada setiap kelompok IMT tidak terdapat perbedaan bermakna antara kelompok IMT normal, berlebih, dan obesitas. Namun, kelompok IMT yang lebih tinggi memiliki kadar gula darah dan trigliserida yang lebih tinggi serta kadar HDL yang lebih rendah. Bila ditinjau IMT terhadap tekanan darah, kelompok IMT normal, berlebih, dan obesitas tidak memiliki perbedaan bermakna terhadap tekanan darah (p=0,956). Pada pengujian statistik dengan uji ANOVA untuk kadar HDL dengan distribusi data yang normal (tabel 5), hasil menunjukkan kelompok IMT normal memiliki kadar HDL yang lebih tinggi daripada kelompok IMT berlebih (*mean difference* [MD]: 9,534; interval kepercayaan [IK] 95%: 1,68-17,39; p=0,018) dengan perbedaan yang bermakna. Bila ditinjau dari RLP/LP dan RLP/TB, pengujian statistik tidak menunjukkan perbedaan bermakna antara kelompok dengan RLP/LP serta RLP/TB normal dan obesitas.

Tabel 4. Pengukuran kadar gula darah, trigliserida, dan HDL pada berbagai kelompok IMT, RLP/LP, dan RLP/TB.

Variabel		Kadar gula darah	Kadar trigliserida	Kadar HDL
IMT	Normal	90 (82-149)	106 (57-493)	63 (39-89)
	Berlebih	95 (71-298)	101,5 (73-651)	51 (31-78)
	Obesitas	93 (80-136)	114 (67-206)	55 (40-81)
Nilai p		**0,801**	**0,751**	**0,051**
RLP/LP	Normal	92,5 (77-149)	111 (67-233)	55 (38-78)
	Obesitas	92 (71-298)	100 (57-651)	55,5 (31-89)
Nilai p		**0,906**	**0,366**	**0,836**
RLP/TB	Normal	89,5 (82-106)	100 (61-164)	66 (45-79)
	Obesitas	93,5 (71-298)	108 (57-651)	55 (31-89)
Nilai p		**0,191**	**0,618**	**0,066**

Catatan: HDL, *high-density lipoprotein*; IMT, indeks massa tubuh; RLP/TB, rasio lingkar pinggang/tinggi badan; RLP/LP, rasio lingkar pinggan/lingkar panggul.

Tabel 5. Hasil uji ANOVA kadar HDL pada berbagai kelompok IMT.

IMT	Normal	Berlebih	Obesitas
Normal		MD: 9,534; IK 95%: 1,68-17,39; p=0,018	MD: 7,697; IK 95%: -0,58-15,97; p=0,068
Berlebih	MD: -9,534; IK 95%; -17,39 - -1,68; p=0,068		MD: -1,838; IK 95%: -9,45 - 5,77; p=0,63
Obesitas	MD: -7,697; IK 95%: -15,97 - 0,58; p=0,068	MD: 1,838; IK 95%: -5,77 - 9,45; p=0,63	

Catatan: IK, interval kepercayaan; IMT, indeks massa tubuh; MD, *mean difference*.

Korelasi didapat positif dan bersifat sangat lemah pada IMT terhadap tekanan darah (r=0,005), kadar gula darah (r=0,001) dan kadar trigliserida (r=0,085). Korelasi IMT terhadap kadar HDL didapat korelasi negatif yang bersifat lemah (r=-0,227). Tidak jauh berbeda, korelasi positif sangat lemah ditemukan antara RLP/LP dengan tekanan darah (r=0,076) dan kadar HDL (r=0,045). Korelasi negatif sangat lemah ditemukan pada RLP/LP terhadap kadar gula darah (r=-0,015) dan trigliserida (r=-0,018). Korelasi positif sangat lemah juga ditemukan pada RLP/TB dengan tekanan darah (r=0,145), kadar gula darah (r=0,170), dan kadar trigliserida (r=0,065). Korelasi negatif lemah ditemukan antara RLP/TB dengan kadar HDL (r=-0,239, p=0,065). Akan tetapi, korelasi tidak menunjukkan hasil bermakna antara IMT, RLP/LP, dan RLP/TB dengan parameter sindrom metabolik yang mencakup tekanan darah, kadar gula darah, kadar trigliserida, dan kadar HDL (tabel 6).

Tabel 6. Hasil korelasi IMT, RLP/LP, dan RLP/TB terhadap kadar gula darah, kadar trigliserida, dan kadar HDL.

Uji korelasi	Tekanan darah	Kadar gula darah	Kadar trigliserida	Kadar HDL
Indeks massa tubuh (IMT)	r=0,005; p=0,969	r=0,001; p=0,993	r=0,085; p=0,518	r=-0,227; p=0,082
RLP/LP	r=0,076; p=0,562	r=-0,015; p=0,907	r=-0,118; p=0,370	r=0,045; p=0,731
RLP/TB	r=0,145; p=0,269	r=0,17; p=0,194	r=0,065; p=0,621	r=-0,239; p=0,065

Catatan: HDL, *high-density lipoprotein*; IMT, indeks massa tubuh; RLP/TB, rasio lingkar pinggang/tinggi badan; RLP/LP, rasio lingkar pinggan/lingkar panggul.

Pembahasan

Komponen sindrom metabolik mencakup lingkar pinggang yang besar, hipertrigliseridemia, kadar kolesterol *high-density lipoprotein* (HDL) rendah, hipertensi, dan hiperglikemia. Diagnosis sindrom metabolik dapat ditegakkan bila terdapat 3 dari 5 komponen yang terpenuhi. Karena hal tersebut, obesitas menjadi salah satu komponen yang menonjol pada pasien dengan sindrom metabolik. Dengan demikian, individu dengan obesitas menjadi perhatian khusus terhadap insidensi sindrom metabolik.[9]

Indeks Massa Tubuh (IMT) merupakan alat diagnostik yang populer digunakan untuk mengklasifikasikan obesitas karena mudah dan murah, hanya mengukur berat dan tinggi badan, walaupun IMT ini tidak dapat mengukur secara akurat komposisi tubuh. IMT normal memiliki risiko lebih rendah untuk terjadinya sindrom metabolik yang pada akhirnya menurunkan risiko morbiditas dan mortalitas akibat sindrom metabolik.[10] Dari penelitian ini, didapatkan hasil yang termasuk kategori indeks massa tubuh normal sebanyak 17 orang (28,3%), berlebih sebanyak 26 orang (43,3%) dan obesitas sebanyak 19 orang (31,7%). Selain itu, pemusatan data IMT berada pada obesitas derajat I. Temuan tersebut mengimplikasikan IMT pekerja kantor di FK Trisakti memiliki obesitas dan berisiko untuk mengidap sindrom metabolik.

Banyaknya lemak dalam perut menunjukkan ada beberapa perubahan metabolisme, termasuk terhadap insulin dan meningkatnya produksi asam lemak bebas, dibanding dengan banyaknya lemak bawah kulit pada kaki dan tangan. Perubahan metabolisme memberikan gambaran tentang pemeriksaan penyakit yang berhubungan dengan perbedaan distribusi lemak tubuh.[11] Ukuran yang lebih sensitive untuk menilai obesitas sentral adalah rasio lingkar pinggang-tinggi badan (RLPTB) dan rasio lingkar pinggang-pinggul (RLPLP). Batas nilai RLPTB adalah 0,5 dan bisa digunakan pada semua jenis kelamin dan semua ras baik untuk anak-anak maupun dewasa.[12]

Dari penelitian ini didapatkan lebih dari separuh responden masuk kategori RLPTB yang besar, yaitu sebanyak 41 orang (68,3%). Sisanya sebanyak 19 orang (31,72%) masuk kategori normal. Responden perempuan lebih banyak masuk dalam kriteria RLPTB yang besar, yaitu sebanyak 38 orang (63,3%). Parameter lain yang dianggap sensitif untuk menilai obesitas sentral adalah rasio antara lingkar pinggang dan lingkar panggul (RLPLP). Berdasarkan kriteria WHO, RLPLP masuk kategori obesitas sentral untuk laki-laki adalah > 0,90 dan perempuan > 0,85.[12] Hasil penelitian didapatkan nilai

yang berimbang antar keduanya, yaitu 50% untuk RLPLP besar dan 50% kategori RLPLP normal, dimana responden perempuan lebih banyak yang masuk dalam kriteria obesitas sentral, yaitu sebanyak 21 orang (35%).

Hipertensi merupakan komponen yang juga termasuk dalam sindrom metabolik. Berdasarkan WHO, tekanan darah (TD) masuk kategori tinggi bila TD sistolik > 140 mmHg dan atau TD diastolik > 90 mmHg. Sigit et al (2020) menyatakan bahwa perempuan Indonesia lebih banyak mengidap sindrom metabolik dibandingkan laki-laki.[2] Ini sesuai dengan hasil penelitian saat ini, yaitu hipertensi pada perempuan (33,3%) lebih banyak daripada laki-laki yang hanya 10%. Secara keseluruhan, sebanyak 34 orang (56,7%) masuk kategori TD normal dan sisanya 26 orang (43,3%) masuk kategori TD tinggi. Temuan tersebut juga menunjukkan bahwa cukup banyak subjek penelitian dengan hipertensi yang juga merupakan komponen dan faktor risiko sindrom metabolik. Hasil statistik menunjukkan perbedaan yang tidak bermakna pada parameter hipertensi terhadap pengukuran antropometri (IMT, RLP/LP, dan RLP/TB). Hal tersebut terjadi karena pemusatan data tensi subjek berada pada normotensi. Dari temuan tersebut dapat disimpulkan bahwa subjek penelitian pekerja kantor baru mengalami obesitas dan belum berprogresi menjadi sindrom metabolik seperti hipertensi. Studi telah menunjukkan bahwa obesitas sentral menjadi awal dari timbulnya sindrom metabolik dengan kontribusi terjadinya resistensi insulin pada individu.[13]

Resistensi insulin merupakan salah satu parameter pada sindrom metabolik. Terjadinya resistensi insulin seperti pada kasus diabetes mellitus serta sindrom metabolik akan menghasilkan kadar glukosa darah puasa yang abnormal. Menurut WHO, kadar glukosa darah puasa abnormal adalah bila didapat hasil di atas 100 mg/dL. Kadar glukosa darah puasa subjek penelitian menunjukkan sebanyak 10 orang (16,7%) termasuk dalam kategori kadar abnormal untuk glukosa darah puasa. Sisanya sebanyak 50 orang (83,3%) dalam kategori gula darah normal. Kadar glukosa darah puasa pada temuan tersebut masih dalam batas normal dengan sedikit subjek penelitian yang memiliki kadar abnormal. Namun, hal tersebut tidak menutup kemungkinan resistensi insulin yang mulai terjadi pada individu dengan obesitas.[14]

Kadar trigliserida menjadi salah satu komponen memenuhi kriteria sindrom metabolik. Berdasarkan kriteria dari World Health Organization (WHO) dan International Diabetes Federation (IDF) untuk kadar trigliserida adalah 150 mg/dl.[11] Hasil pemeriksaan

menunjukkan bahwa sebanyak 13 subjek (21,7%) masuk dalam kategori kadar trigliserida tinggi. Sisanya sebanyak 47 subjek masuk dalam kategori kadar trigliserida normal.

Kadar kolesterol HDL mempunyai efek menurunkan risiko terjadinya aterosklerosis pembuluh darah termasuk dalam salah satu kriteria sindrom metabolik. Berdasarkan kriteria WHO, batas nilai kadar HDL berbeda untuk laki-laki dan perempuan. HDL masuk kategori sindrom metabolik untuk laki-laki bila kadar < 40 mg/dl. Sedang untuk wanita bila kadar HDL < 50 mg/dl.[10] Hasil penelitian menunjukkan sebagian besar masuk dalam kategori HDL tinggi, yaitu sebanyak 57 orang (95%). Sisanya sebanyak 3 orang masuk dalam kategori HDL rendah. Kelompok IMT normal memiliki kadar HDL yang lebih tinggi daripada kelompok IMT berlebih dengan perbedaan yang bermakna (MD: 9,534; IK 95%: 1,68-17,39; p=0,018). Hasil tersebut menunjukkan bahwa kadar HDL berkemungkinan menjadi perubahan pertama terhadap terjadinya peningkatan IMT pada individu.[10]

Kesimpulan

Dari penelitian didapatkan data karakteristik indeks antropometri yang menggambarkan obesitas secara umum dan obesitas sentral serta karakteristik komponen-komponen sindrom metabolik pada karyawan FK Trisakti. Untuk menilai hubungan antara indeks antropometri tersebut dengan komponen-komponen sindrom metabolik, maka perlu dilanjutkan dengan uji statistik yang sesuai seperti yang sudah disebutkan di atas.

Author Contribution

Study conception, design: AT, DN, CS, MS; data collection : AT, DN, CS, KM, LP, analysis, interpretation of results, manuscript preparation : AT, DN, CS, MS, KM, LP; All authors reviewed the results and approved the final version of the manuscript.

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Conflict Of Interest

Dalam penelitian ini tidak ditemukan adanya konflik kepentingan

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