CORRELATION OF WAIST HIP CIRCUMFERENCE RATIO WITH FASTING BLOOD GLUCOSE CONSENTRATION AT THE AGE OF 30-65 YEARS IN THE DISTRICT OF KEDIRI

Cien Stevani[1)], Nita Kurniawati[2)], Dyana Sarvasti[3)]

DOI: https://doi.org/10.33508/jwmj.v5i2.3708

ABSTRACT

Background: The World Health Organization (WHO) stated that obesity is a world epidemic. According to basic health research in 2018, the prevalence of central obesity in the population aged 15 years in Kediri Regency/City has a higher prevalence compared to the average prevalence in East Java Province. The waist hip circumference ratio is one of the anthropometric calculations that can be used to assess central obesity. The high prevalence of central obesity in Indonesia is closely related to the incidence of non-communicable diseases, including diabetes mellitus. However, only 25% of people with diabetes mellitus know that they have diabetes. Routine blood sugar checks for residents in districts/cities, especially in the city of Kediri, are also at a low level of 3.6%, so this is the reason for conducting this study.
Objective: To study the correlation between waist hip circumference ratio with fasting blood glucose concentration at the age of 30-65 years in the District of Kediri.
Method: Cross sectional observational analytical research approach. Sampling using consecutive sampling. Testing the correlation between two variables using the Spearman correlation test. The correlation between variables is considered significant if the p value <0.05 is obtained.
Result: This research was conducted in Sonorejo Village, Grogol District, Kediri Regency, East Java on August 10 – August 12, 2021. Otained 40 respondents with an age range of 30-65 years. The correlation between waist hip circumference ratio with fasting blood glucose consentration was not statistically significant (p=0,453). The correlation value of 0.122 indicates a very weak correlation strength and is not clinically significant.
Conclusion: There is no correlation between waist hip circumference ratio with fasting blood glucose concentration at the age of 30-65 years in the District of Kediri.

Keywords: Waist hip circumference ratio, fasting blood glucose, Kediri.

1) Student of Medical Faculty Widya Mandala Catholic University Surabaya, Kalisari Selatan 1 Surabaya Email : cen.cen194@gmail.com
2) Neurology Department Medical Faculty Widya Mandala Catholic University Surabaya, Kalisari Selatan 1 Surabaya
3) Internal Medicine Departement Medical Faculty Widya Mandala Catholic University Surabaya, Kalisari Selatan 1 Surabaya

INTRODUCTION

The World Health Organization (WHO) states that obesity is a world epidemic, whose incidence has increased significantly since 2013[1]. One of the divisions of obesity is central obesity which mostly occurs in the 45-54 year age group as much as 42.3%[2]. According to Riskesdas 2018, the population aged 15 years in Kediri Regency/City has a higher prevalence compared to the average prevalence in East Java Province, which is 34.47%[2]. The high prevalence of central obesity in Indonesia is closely related to the incidence of diabetes mellitus, this is related to the increase in visceral adipose tissue with various metabolic disorders which are risk factors in the incidence of type 2 diabetes mellitus[3]. Waist-hip ratio is a calculation for reflects adipocytes in the stomach, and has been suggested as a better measure to predict several disease risk factors, one of which is type 2 diabetes mellitus[3] .

Diabetes is one of the current health problems. Indonesia is one of the countries in the Western Pacific region which is ranked 7th out of 10 countries with the highest number of people with diabetes in 2019, which is 10.7 million[4]. Riskesdas 2018 shows the prevalence of diabetes mellitus in Indonesia based on a doctor's diagnosis at the age of ≥ 15 years is 2%[5]. However, according to the results of the blood sugar examination, it showed an increase of 8.5% in the same year in 2018[5]. This shows that only 25% of diabetics know that they have diabetes[5].

Based on the 2018 Riskesdas, the proportion of people who have routine blood sugar levels in districts/cities, especially in Kediri City, is still low at 3.6%, compared to the proportion of people who have never checked blood sugar levels of 80.88%[2]. This study aims to examine the correlation between waist ratio and fasting blood glucose concentration at the age of 30-65 years in Kediri Regency.

METHODS

This study is an observational analytic study using a cross-sectional research design. The sampling technique used in this study was non-probability sampling, namely consecutive sampling. There were 40 research sample respondents who met the inclusion and exclusion criteria.

Inclusion criteria in the study are: 1. People aged 30-65 years; 2. Willing to be a research respondent and sign an informed consent; 3. The body is able to

stand upright. The study exclusion criteria were: 1. Having a history of diabetes mellitus; 2. Taking antihyperglycemic drugs; 3. Pregnant; 4. Respondents do not fast (no energy intake enters the body) for more than 8 hours; 5. Taking drugs that affect blood glucose (corticosteroids, beta blockers, calcium channel blockers, antidepressants, and antibiotics); 6. Taking hormone replacement therapy such as premarin; 7. Under stressful conditions such as post-surgery, post-traumatic; 8. Have a history of metabolic disease (Cushing's syndrome, thyroid hormone disorders).

The location of this research was carried out in Sonorejo Village, Grogol District, Kediri Regency, East Java, in August 2021.

Respondents must first fast for at least 8 hours at night, then collect data in the morning in the form of capillary blood sampling and then measure waist and hip circumference using a measuring tape, record the measurement results and then calculate the waist-to-hip ratio by comparing the circumference of the waist and hips. waist to hip circumference. Fasting blood glucose concentration was measured using a glucometer with units of mg/dL, while waist and hip circumference measurements used a measuring tape or metlin meter with an accuracy of 0.1 cm.

Data analysis in this study used bivariate analysis to see the relationship

between waist-to-hip ratio and fasting blood glucose concentration. Normality test was performed using the Kolmogorov Smirnov test. The results of the data in this study had an abnormal distribution ($p < 0.05$) so that it was continued using the Spearman correlation test. test.

RESULT

Table 1. Demographic Characteristics of Respondents

Characteristics	Frequency (n=40)	Percentage (%)
Age (year)		
30-39	11	27,5
40-49	13	32,5
50-59	7	17,5
60-65	9	22,5
Sex		
Male	14	35
Female	26	65
Job Status		
Work	29	72,5
Does not work	11	27,5
Habit		
Smoke	6	15
Do not Smoke	34	85

Table 2. Characteristics of respondent data based on the ratio of waist to hip circumference

Sex	Waist to Hip Ratio	
	Median	Minimum-Maximum
Female (n=26)	0,92	0,8-1,08
Male (n=14)	0,95	0,83-1,04
All Respondents (n=40)	0,93	0,8-1,08

Table 3. Characteristics of respondent data based on fasting blood glucose concentration

Sex	Fasting Blood Glucose Concentration (mg/dL)	
	Median	Minimum-Maximum
Female (n=26)	88	62-374
Male (n=14)	101	76-226
All Respondents (n=40)	92	62-374

Table 4. Results of data analysis of the relationship between waist circumference ratio and fasting blood glucose concentration.

Variable	Median	Minimum-Maximum	N	Correlation Coefficient (r)	P value
Waist to Hip Ratio	0,93	0,8-1,08	40	0,122	0,453
Fasting Blood Glucose Concentration (mg/dL)	92	62-374	40		

Most of the respondents in this study had an age range of 40-49 years and were female. Most of the research respondents worked and had a habit of not smoking (Table 1). Based on Table 2, it shows that the median value from the calculation of the waist-to-hip ratio for all respondents is 0.93, with a minimum value of 0.8 and a maximum value of 1.08. Table 3 shows that the median value of fasting blood glucose concentration in all respondents is 92 mg/dL, with a minimum value of 62 mg/dL and a maximum value of 374 mg/dL. In Table 4, the analysis of data on all respondents uses the Spearman correlation test.

The correlation coefficient (r) was 0.122 and p = 0.453 (p>0.05) which indicated that there was no correlation between the hip circumference ratio and blood glucose concentration.

DISCUSSION

Most of the respondents in the study had an age range of 40-49 years and were female. This is in accordance with the 2018 Riskesdas data that the high prevalence of central obesity is in the 45-54 year age group [(2)].

Based on previous research conducted by Wiwik, age is the most risky factor in the incidence of central obesity [(6)]. It is known that as age increases, the risk of experiencing central obesity also increases, this is influenced by changes in a person's body composition, namely a decrease in muscle mass and an increase in fat mass[(2)]. Other factors that also play a role in the incidence of central obesity, one of which is gender, women are more at risk of developing central obesity than men [(7),(8)]. From the results of research conducted by Nimas, women have a 1.7 times greater risk of central obesity than men, this is due to differences in levels of physical activity and differences in energy intake between men and women [(7),(8) ,(9)].

Central obesity has more visceral fat than subcutaneous fat. Visceral fat when compared to subcutaneous fat has a higher level of lipolysis, this will cause an increase in free fatty acids to the liver which then causes an increase in the gluconeogenesis process, resulting in an increase in glucose production [(10)].

From the results of the study, it was found that male respondents had higher fasting blood glucose values than female respondents. This may be related to the respondent's habits such as smoking, cigarettes contain many active ingredients, one of which is nicotine which has an effect on increasing free radicals, where these free radicals will damage pancreatic beta cells so that they can interfere with insulin secretion. Nicotine can also trigger the hormone cortisol, and adrenaline which causes an increase in blood glucose levels [(11)].

The results are different from the research conducted by Nova, which states that women are more at risk for the incidence of diabetes mellitus, this is influenced by the increase in fat

distribution due to hormonal processes during premenstrual and postmenopausal, as well as the lack of physical activity in women. Physical activity has a role in increasing glucose in tissues and increasing insulin support [12].

The results of data analysis in this study indicate that there is no correlation between waist circumference ratio and blood glucose concentration. A person with a large waist circumference ratio will not always have a high blood glucose concentration. There are several possible factors that influence the results of the study, one of which is the population factor, in this study the dominant age range is 40-49 years, this is related to the process of glucose homeostasis through the role of pancreatic beta cells, so that when glucose levels increase in blood The insulin secreted by the pancreas will also increase so that blood glucose levels remain normal.

Another influential factor in the study is the possibility of physical activity, in this study most of the respondents had a working status so that they had a sufficient level of activity, which affected the utilization of glucose by the tissues, causing glucose in the blood to remain within normal limits [12]. The results are the same as research conducted by Ayatun that there is no significant relationship between waist ratio and fasting blood glucose levels, this is probably influenced by the suffering of respondents who suffer from obesity, so that pancreatic beta cells can still compensate for the increase in blood glucose[13].

This study has limitations, namely the lack of information about the characteristics of the respondents, the researchers did not conduct an examination to determine for sure the presence of hormonal factors that can affect blood glucose levels. Researchers only get information about fasting that has been done by respondents based on history. In this study sampling using capillary blood so it cannot be used for a definite diagnosis of diabetes mellitus. There are also several factors that can affect blood glucose, including genetic factors, age, race and ethnicity, physical activity, and diet.

REFERENCES :

1. Karimah M. Rasio Lingkar Pinggang-Panggul Memiliki Hubungan Paling Kuat Dengan Kadar Glukosa Darah. J Berk Epidemiol [Internet]. 2018;6(3): 219-226 [cited 10 Maret 2021] Available from: : http://journal.unair.ac.id/index.php/JBE/.
2. Riset Kesehatan Dasar (Riskesdas) 2018. Badan Penelitian dan Pengembangan Kesehatan Kementerian RI Tahun 2018. 2019. p. 582-589.
3. WHO. Waist Circumference and Waist-Hip Ratio: Report of a WHO Expert Consultation. World Heal Organ [Internet]. 2011 [cited 10 Maret 2021]; Available from: : https://www.who.int/publications/i/item/9789242501491
4. International Diabetes Federation.Diabetes Mellitus Atlas. 9th ed.[Internet].2019 [cited pada 11 Maret 2021]; Diunduhdari: www.diabetesatlas.org
5. Pangribowo S. Tetap Produktif, Cegah, dan Atasi Diabetes Melitus.Pusat Data dan Informasi Kementerian Kesehatan RI; 2020.
6. Agustina W. Usia Sebagai Faktor Risiko yang Paling Banyak Ditemukan Pada Obesitas di Puskesmas Ciptomluyo Kecamatan Sukun Kota Malang. Jurnal Kesehatan Mesencephalon. [Internet]. 2017; 3(2):62-67 [cited pada tanggal 1 November 2021]; Available from: : https://ejournal.stikeskepanjen-pemkabmalang.ac.id/index.php/mesencephalon/article/view/47/24
7. Sofa IM. Kejadian Obesitas, Obesitas Sentral, dan Kelebihan Lemak Viseral pada Lansia Wanita. Amerta Nutr [Internet].2018;2(3): 228-236 [cited pada 11 Maret 2021]; Available from: : https://e-journal.unair.ac.id/AMNT/article.view/8788
8. Puspitasari N. Faktor Kejadian Obesitas Sentral pada Usia Dewasa. HIGEA (Journal of Public Health Research and Development) [Internet].2018;2(2):249-59 [cited pada tanggal 29 Maret 2021]; Available from: : https://journal.unnes.ac.id/sju/index.php/higeia/article/view/21112
9. Maria, Adolfina C., Rante, Su D. T., Woda, Rahel. Hubungan Obesitas Sentral dengan Kadar Glukosa Darah Puasa pada Mahasiswa Fakultas Kedokteran Universitas Nusa Cendana. Candana Med J [Internet]. 2019;18(3): 350-356 [cited pada tanggal 12 Maret 2021]; Available from: : https//ejournal.undana.ac.id/CMJ/article/download/2637/1903
10. Jameson JL, Kasper DL, Longo DL, Fauci AS, Hauser SL, Loscalzo J. Harrison Principles of Internal Medicine 20th edition. McGraw-Hill Education. 2018.
11. Haiti M. Perokok Aktif dan Pasif dengan Glukosa Darah. [Internet]. 2019 [cited pada tanggal 1 November 2021]; Available from: : http://eprints.ukmc.ac.id/3595/1/Artikel%20Hubungan%20Remaja%20Perokok%20Aktif%20dan%20Pasif%20dengan%20%281%29.pdf
12. Rita N. Hubungan Jenis Kelamin, Olah raga dan Obesitas dengan Kejadian Diabetes Mellitus pada Lansia. Jurnal Ilmu Kesehatan (JIK). [Internet]. 2018; 2(1):93–100 [cited pada tanggal 1 November 2021]; Available from: : https://jik.stikesalifah.ac.id/index.php/jurnalkes/article/view/52
13. Ilmi AF, Utari DM. Hubungan Lingkar Pinggang Dan Rasio Lingkar Pinggang-Panggul (RLPP) Terhadap Kadar Gula Puasa pada

Mahasiswa Prodi Kesehatan Masyarakat STIKes Kharisma Persada. Journal of Nutrition College. [Internet]. 2020; 9(3):222–7 [cited pada tanggal 20 April 2021]; Available from: : https://ejournal3.undip.ac.id/index.php/jnc/article/view/27658