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WAIST CIRCUMFERENCE DIFFERENCE OF SOMATOTYPE ELDERLY ON SAWUNGGALING SURABAYA

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ABSTRACT

Background: Central obesity of elderly has been a health problem. Central obesity is related to a high risk of cardiovascular disease and metabolic disorders. While somatotype with endomorph type is significantly correlated to the waist circumference where waist circumference is one kind of central obesity measurement. The aim of this research is to determine whether there is a waist circumference difference among somatotype groups of elderly. **Methods:** The design of this research is *cross sectional.* The research population was elderly in RW 5 Sawunggaling Surabaya. The number of the sample was 80 respondents with *simple random sampling technique.* Waist circumference and 10 anthropometric measurements were done to the respondents. Somatotype calculation used Heath-Carter method. Basic characteristic data of the research subject used univariate analysis. Hypothetic test used Kruskal-Wallis test continued with Mann Whitney U test. *Dependent* variable of this research is waist circumference value. *Independent* variable in this research is somatotype elderly. **Results:** Kruskal-Wallis statistic test is p=0.003 where p<α (0.05) means there is a significant waist circumference difference among somatotype. Mann Whitney U test result shows a waist circumference difference in central somatotype group with endomorph p=0.019, central with endomorph-mesomorph p=0.006, central with mesomorph p=0.049, endomorph-mesomorph with mesomorph-ectomorph p=0.017, endomorph-mesomorph with ectomorph p=0.041, mesomorph with mesomorph-ectomorph p=0.023. **Conclusion:** Somatotype endomorph, mesomorph and endomorph-mesomorph waist circumference tend to be higher than another type because there is more body fat as a result of *visceral* digestion domination in endomorph type.

Keywords: waist circumference, somatotype, elderly.

INTRODUCTION

Nutrition problem in elderly is a series of problem since young age which manifests after old age. Most of the nutrition problem in elderly is overweight or obesity which triggers degenerative disease like coronary heart disease, diabetes mellitus, hypertension, gout, rheumatism, kidney, liver cirrhosis, bile and cancer (Adriani & Wirjatmadi, 2012). The increasing fat tissue is an important thing to know the risk which increase diseases related to obesity. Especially excessive abdominal adipose tissue (*visceral)* is related with the high risk for cardiovascular disease and metabolic disorder like diabetes, dyslipidemia and metabolic syndrome and blood pressure. Therefore abdominal fat measurement is an important action (Mann & Truswell, 2016; Sari *et al.*, 2016). Abdominal obesity measurement can use waist

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circumference measurement , give result almost as good as measurement using MRI or CT scan. Waist circumference measurement is done by measuring waist between border point of the lowest rib and femoral endpoint, measured in a circle (Hardiansyah & Supariasa, 2016). Waist circumference > 90 cm in man and > 80 cm in woman indicates increased risk in Asian people (Mann & Truswell, 2016).

According to World Health Organization (2017) in the year of 2014, 15 % women and 11% men aged 18 years above have obesity. Nationally central obesity prevalence is 26,6% higher than prevalence in 2007 (18.8%). The highest prevalence is in Jakarta (39.7%) and 18 provinces have central obesity prevalence above national rate, those are East Java, Bali, Riau, Yogyakarta, Middle Sulawesi, Maluku, Maluku Utara, Riau islands, West Sumatera, North Sumatera, South Sulawesi, West Papua , East Kalimantan, Bangka Belitung, Papua, Gorontalo, North Sulawesi (Badan Penelitian dan Pengembangan Kesehatan (BPPK) Kemenkes RI, 2013).

Besides nutritional status, every person including elderly also has a body shape which is called somatotype. Somatotype is a method to illustrate human body into number shape to the shape and body composition (Dequet & Carter, 2009). Somatotype type is significantly influenced by genetic but in addition there are environmental factors such as nutrition and daily tasks that are very demanding (Saranga *et al*., 2008). Somatotype reflects whole body outlook and express the meaning of the totality of morphological features of human body. In somatotype anthropological measurement also measure skinfold , it is one kind of fat measurement indicator of body fat measurement. In patient who suffers coronary artery disease, endomorph is significantly correlated to waist circumference (Williams *et al*., 2000 *cit* Singh, 2007). Endomorph has a positive relationship risk factor, i.e. with cardiovascular risk in another older women (Malina *et al*., 1997 *cit* Singh, 2007). According to Katzmarzyk (1998) *cit* Singh (2007) who explored the relationship between physical and metabolic fitness which is rated from triglyceride level, high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C), blood glucose level, the result showed that high endomorph and mesomorph tends to have high blood fat level. By looking at somatotype endomorph which is related to waist circumference, then on this research, the researcher wanted to analyze waist circumference in somatotype elderly. This research has a benefit to monitor fat excess in elderly by measuring the waist circumference to determine central obesity in elderly and somatotype kind in elderly. The aim of this research is to determine whether there is a waist circumference difference among somatotype groups.

METHODS

This research used *cross sectional* design. The research population is RW 5 Sawunggaling Surabaya elderly who don't have type 2 DM history and they present when the research took place. The number of the sample in this research is 80 respondents with *simple random sampling.* This research got ethical clearance for doing the research. Each respondent is measured his/her waist circumference and 10 anthropometric measurements those are

ISBN: 976-602-5617-11-9

body weight, height, *triceps skinfold, subscapular skinfold, supraspinalis skinfold, medial calf skinfold, humerus width, femur width, biceps girth, cal girth* to determine the type of somatotype of the respondent. Somatotype calculation is done by entering 10 anthropometric measurements into Heath-Carter method.

Univariate analysis in the form of frequency and percentage is used as the basic characteristic of the research subject. Hypothetic test used Kruskal-Wallis test with level of meaning was $p<0.05$ to know the waist circumference in somatotype and then continued with Mann Whitney U test to know the somatotype group which has waist circumference value difference (Budiman, 2011).

D*ependent* variable in this research was elderly waist circumference. I*ndependent* variable in this research was elderly somatotype kind obtained from anthropometric measurement and calculated by Heath-Carter method consist of seven kinds of somatotype.

RESULTS

The result of the research is data with descriptive statistics table with Kruskall- Wallis test continued with Mann Whitney U test.

Table 1 shows that the highest waist circumference mean rank is endomorph 58.83 and the lowest is mesomorph-ectomorph 2.5.

Table 2 shows Kolmogorov-Smirnov statistic test result that is not normal distributed variable so it used Kruskal-Wallis test continued with Mann Whitney U.

Table 3 shows that the waist circumference mean value of endomorph tends higher in endomorph 94.33 followed by endomorph-mesomorph 90.45 and the lowest is mesomorph-ectomorph 65.5. The minimal waist circumference is minimal 63 cm, maximum is 114 cm.

Kruskal-Wallis statistic test gives result $p=0.003$ where $p<\alpha$ (0.05) . It means that there is a significant difference of waist circumference among somatotype. To determine the waist circumference difference among somatotype specifically, *Post Hoc* test or continued test is needed, by using Mann Whitney U test to verify the mean difference of one group among another somatotype.

Table 4 above shows that there are six somatotype groups which have different waist circumference. The somatotype groups are central with endomorph, central with endomorph-mesomorph, central with mesomorph, endomorph-mesomorph with mesomorph-ectomorph, endomorph-mesomorph witsh ectomorph, mesomorph with mesomorph-ectomorph

ISBN: 976-602-5617-11-9

Table 1. Waist circumference descriptive statistics in somatotype

	Somatotype	N	*Mean Rank*
Waist circumference	Central	6	18.00
	Endomorph	3	58.83
	Endomorph-Mesomorph	49	45.06
	Mesomorph	18	39.94
	Mesomorph-Ectomorph	2	2.50
	Ectomorph	2	11.75
	Total	80	

Table 2 Normality statistics test

Somatotype		Waist circumference
Central	Statistic	0.308
	p	0.078*
Endomorph	Statistic	0.385
	p	-
Endomorph-mesomorph	Statistic	0.099
	p	0.200*
Mesomorph	Statistic	0.143
	p	0.200*
Mesomorph-ectomorph	Statistic	0.260
	p	-
Ectomorph	Statistic	0.260
	p	-

Kolmogorov-Smirnov statistic test, p<0,05 not normal distributed

Table 3. Waist circumference descriptive statistic among somatotype

	Somatotype		Statistic
Waist circumference	Central	Mean	78.75
		Min	63
		Max	85
		Std.	8.97
	Endomorph	Mean	94.33
		Min	89
		Max	97
		Std.	4.61
	Endo-Meso	Mean	90,45
		Min	74
		Max	114
		Std.	8.97
	Mesomorph	Mean	87.53
		Min	73
		Max	99
		Std.	8.57
	Meso-Ecto	Mean	65.50
		Min	64
		Max	67
		Std.	2.121
	Ectomorph	Mean	76.25
		Min	76
		Max	77
		Std.	0.35

ISBN: 976-602-5617-11-9

Table 4 Descriptive statistics and inferential waist circumference of somatotype

	Somatotype	N	*Mean Rank*	*Sum of Ranks*	p
Waist circum ference	Central Endomorph	6 3	3.5 8.0	21.00 24.00	0.019*
	Central Endomorph-Mesomorph	6 49	10.9 30.0	65.5 1474.5	0.006*
	Central Mesomorph	6 18	7.5 14.1	45.5 254.5	0.049*
	Central Mesomorph-Ectomorph	6 2	5.1 2.5	31 5	0.180
	Central Ectomorph	6 2	4.8 3.5	29 7	0.502
	Endomorph Endomorph-Mesomorph	3 49	35.3 25.9	106 1272	0.298
	Endomorph Mesomorph	3 18	15.5 10.2	46.5 184.5	0.173
	Endomorph Mesomorph-Ectomorph	3 2	4 1.5	12 3	0.076
	Endomorph Ectomorph	3 2	4 1.5	12 3	0.076
	Endomorph-Mesomorph Mesomorph	49 18	35.1 30.8	1722.5 555.5	0.424
	Endomorph-Mesomorph Mesomorph-Ectomorph	49	27	1323	0.017*
	Endomorph-Mesomorph Ectomorph	49 2	26.8 5	1316 10	0.041*
	Mesomorph Mesomorph-Ectomorph	18 2	11.5 1.5	207 3	0.023*
	Mesomorph Ectomorph	18 2	11.1 4.2	201.5 8.5	0.115
	Mesomorph-Ectomorph Ectomorph	2 2	1.5 3.5	3 7	0.121

Statistic test used Mann Whitney U, N: respondents number, p: *probability*, *p<α (0.05) there is significant difference

DISCUSSION

Waist circumference exceeds than threshold is called central obesity. According to Hardiansyah & Supariasa (2016) abdominal or central obesity assessment can use waist circumference measurement, give result almost as good as measurement using MRI or CT scan. Waist circumference measurement is done by measuring the waist between the lowest border points of ribs and the end point of the femur bone, measured in a circle. The increased fat tissue location is an important thing to know the increased risk of diseases related to obesity (Ahmad & Imam, 2016). Especially excessive abdominal adipose tissue (*visceral*) is related with high risk of cardiovascular disease and metabolic disorder such as diabetes, dyslipidemia and metabolic syndrome and blood pressure. That is why that the abdominal fat measurement is important (Astuti *et al.*, 2012; Mann & Truswell, 2016; Sari *et al.*, 2016). Woman

ISBN: 976-602-5617-11-9

waist circumference > 80 cm and man > 90 cm are called beyond normal and is at risk to some of the disease especially in Asia (Mann & Truswell, 2016)i.e. type 2 Diabetes Mellitus. Hardiman *et al.* (2009) said in their research that waist circumference measurement is recommended to be a routine action to identify type 2 DM in men and women of 40-60 years old . Susilowati *et al*. (2014) in their research said that there is a strength of relationship of waist circumference as an obesity indicator towards the occurrence of type 2 DM. Waist circumference measurement has a benefit to know whether someone has a risk to some diseases in elderly. By knowing one's nutritional status especially who has a central obesity will help someone to overcome the problem of excess nutritional status by improving their life style and dietary habit.

Every person has a different kind of somatotype, which reflects the whole body outlook and gives the morphology characteristic totality mean of human body (Singh, 2007). This research also found six types of somatotype in respondents, central, endomorph, endomorph-mesomorph, mesomorph, mesomorph-ectomorph and ectomorph. This somatotype is produced by data processing of ten kinds of anthropometric measurements, one of these is *skinfold* measurement or fat thickness in some places. There is an endomorph type in this somatotype which is at risk to type 2 DM . Supported by the research result which said that there is a significantly positive relationship between somatotype and type 2 DM in women, and endomorph type is more risk to type 2 DM (Kurniawaty, 2014). Somatotype can be a suitable tool for measuring in pathology and is a successfully applied method for risk factor and pathology research. (Buffa *et al*., 2007). It is the same with anthropometric waist circumference measurement that shows the relationship between type 2 DM and central obesity in elderly.

Waist circumference in this research is about 63 cm, maximum is 114 cm in elderly. There are 6 types of somatotype of elderly in this research, central type, endomorph, endomorph-mesomorph, mesomorph, mesomorph-ectomorph, ectomorph. Waist circumference mean value of endomorph type tends 94.33 higher followed by endomorph-mesomorph 90.45 and the lowest is mesomorph-ectomorph type 65.5. Along with descriptive analysis of Kruskal-Wallis statistic test $p=0.003$ where $p<\alpha$ (0.05). It means there is a significant difference in waist circumference among somatotype. A further Mann Whitney test said that there are 6 somatotype groups who have different waist circumference. The somatotype groups are central with endomorph, central with endomorph-mesomorph, central with mesomorph, endomorph-mesomorph with mesomorph-ectomorph, endomorph-mesomorph with ectomorph, mesomorph with mesomorph-ectomorph. If it is analyzed in every kind of somatotype, central type is a type which doesn't have any more dominant component, endomorph type shows relative level of body fat produced from visceral digestion domination, while mesomorph type reflects body component that comes from the middle body layer that is mesoderm which produces bone, muscle and connective tissue. Mesomorph illustrates the relative musculoskeletal development of the body (Singh, 2007).

Central type has a significant waist circumference difference with endomorph type p=0.019. Endomorph type has waist circumference mean 94.33 cm while central type 78.75 cm. Endomorph type tends have a more dominant fat body score, where body fat can be measured by waist circumference measurement to determine central obesity, excessive abdominal adipose stacking (*visceral*). Central type with mesomorph also has a significantly different waist circumference value p=0.049, central waist circumference mean value is 78.75 cm while mesomorph is 87.53 cm. Mesomorph waist circumference is larger than central waist circumference value. Mesomorph type reflects the development of musculoskeletal although musculoskeletal fat stacking development in this somatotype is still higher than central type which doesn't have any somatotype domination. Central type with ectomorph doesn't have a significant difference about elderly waist circumference value p=0.502. It shows that central type tends not have central fat stacking, the same with ectomorph type which illustrates relative slimness, reflects the body component from the outer body layer or ectoderm which forms skin, nail and sensory organ (Singh, 2007; Morin, 2014). This component also explains the related physical aspects such as slim, weak and small smooth body, small bones with thin muscles, relative long extremities. It doesn't mean that the person should always be high, flat abdomen and lumbal curve, relative increased and sharp thorax, narrow shoulders upfront and muscle path is not visible invisible ((Dequet & Carter, 2009)).

CONCLUSION

There is a waist circumference value difference among somatotype in elderly. In endomorph somatotype, endomorph-mesomorph and mesomorph tends have a higher waist circumference value than another types.

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