

## Effect of Cocoa on Body Weight, Waist Circumference and Visceral Fat Patient with Central Obesity

Sugirah Nour Rahman<sup>1</sup>, Citrakesumasari<sup>2</sup>, Nurpudji Astuti Taslim<sup>3</sup>

<sup>1</sup>Graduate School, <sup>2</sup>Department of Nutrition School of Public Health, <sup>3</sup>Department of Nutrition School of Medicine, Universitas Hasanuddin, Jalan Perintis Kemerdekaan Km. 10, PO Box 90245, Makassar, Indonesia

Corresponding Author: Sugirah Nour Rahman

### ABSTRACT

**Background:** Central obesity is a condition of excess fat in the abdomen so that it can be at risk for various diseases of metabolic disease.

**Objectives:** The objective of this study was to determine the effect extracts Theobroma cacao L on body weight, waist circumference and visceral fat.

**Materials and Methods:** This study was Double Blind Randomized Clinical Trial. Forty (40) samples using Hospital Based on obese central patient with dyslipidemia in Universitas Hasanuddin Hospital. Sample is divided into two group, the intervention group by giving Theobroma cacao L extracts 4g/day and Control group placebo 4 g/day for 8 weeks. Body Weight measurements by TANITA digital scales, waist measurements by One Med tape and visceral fat measurements using BIA (Bioelectrical Impedance Analysis)

**Result:** The study found out, from 40 samples, 6 were dropped out and 34 samples completed the study (17 intervention and 17 control group). Both groups at the baseline did not show any differences. At the end of the study showed a decrease in Body Weight, Waist Circumference and Visceral Fat was higher in the intervention group compared with the control group with the mean changes of each group were (BB:  $0.87 \pm 1.97$  VS  $0.65 \pm 1.61$ ) (LP:  $2.09 \pm 2.47$  VS  $-1.26 \pm 216$ ) (VF:  $0.29 \pm 0.59$  VS  $0.18 \pm 0.81$ ) although statistically not significant ( $p > 0.05$ ). There was a significant reduction both intervention and control group for waist circumference with  $p < 0.05$ .

**Conclusion:** Consumption of extract Theobroma cacao L 4 gr / day for 8 weeks benefit for reduced body weight, waist circumference and visceral fat.

**Key Words:** Theobroma cacao L, Weight Loss, Waist Circumference, and Visceral Fat

### INTRODUCTION

Obesity as a public health problem that now threatens the world's population. In 2014, there are more than 1.9 billion adults; whose age over 18 is overweight and over 600 million are obese. There are about 39% of adults over 18 are overweight (38% are male and 40% are female) and 13% are obese. Whereas in 2013, there were 42 million children under the age of five were overweight and obese. <sup>[1]</sup> Obesity may be the origin of cardiometabolic diseases (e.g. hypertension, type 2 diabetes, and dyslipidemia. <sup>[2,3]</sup>

Obesity is thought to be the fourth largest risk factor contributing to death in the UK after hypertension, smoking, and hypercholesterolemia. In a study conducted by the Health Survey for England (HSE) showed an increased prevalence of obesity in the UK in 1993 by 15% to 26% in 2014. <sup>[4]</sup> In the Netherlands, 52.5% of the adult population (> 20 years) are overweight and 18.8% are obese. The prevalence of obesity was higher for men (56.4%) than women (48.7%). The proportion between obese men and women was 18.1% and 19.5%. <sup>[5]</sup>

Indonesia as a developing country is inseparable from the high prevalence of central obesity. Based on the results of Basic Health Research in 2007 on population aged  $\geq 18$  years showed that central obese patients in Indonesia amounted to 18.8%. Meanwhile, South Sulawesi province has become one of the

provinces with prevalence above the national average of 21.4%. The prevalence of national central obesity has increased in 2013. Based on the same data source, 26.6% of Indonesia's population is found to be obese. So there is an increased prevalence of large central obesity of 7.8% from 2007 to 2013. [6,7]

Studies of human intentions that show high chocolate consumption of cocoa significantly increase the success of weight loss, weight loss in the group that received 10% higher chocolate than the low-carbohydrate diet group within three weeks. [8] In 2012, Golomb et al. showed a connection between regular chocolate consumption and a lower body mass index. Cocoa is one of Indonesia's mainstay commodities. [9] In 2010, Indonesia became the 2nd largest cocoa producer in the world after Ivory Coast. [10] Thus, before it was separated from West Sulawesi, South Sulawesi Province had the highest cocoa production in Indonesia over 70%. Although the area has been reduced now, South Sulawesi is still able to contribute 40% cocoa to Indonesia. These products have been widely consumed throughout the world and have been widely studied because cocoa is known to be a significant source of phytochemical compounds and has a good effect on human health. [11]

Cocoa contains flavonoids which are a source of antioxidants, especially flavan-3-ol sub-class (flavonols) and oligomers of flavonols, epicatechins and catechins and polymeric known as pro anthocyanidins (proanthocyanidin), which can reduce the risk of atherosclerosis. [12] Cocoa polyphenol compounds have high concentrations in the form of flavonols with beneficial antioxidant effects. In addition, flavonoids are known to suppress inflammation, by inhibiting cyclooxygenase-2, an enzyme that regulates during the inflammatory process, as well as some types of tumor formation. There is also evidence that some flavonols may inhibit atherogenesis by interacting with beta-platelet growth factors. Further beneficial effects include decreased

blood pressure in hypertensive subjects, increased endothelial vasodilation function, and inhibition of platelet activation and function. [13,14] For many years it was believed that the beneficial effects of flavonoids were exclusively due to their antioxidant capacity. [15]

## **MATERIALS AND METHODS**

### **Location of Research**

This research was conducted at Poly Nutrition Hospital of Hasanuddin University of Makassar and network, Poly Nutrition Wahidin Sudirohusodo Hospital Makassar and network.

### **Design and Type of Research**

The research type is experimental research with Randomized Clinical Trial, (RCT) pre-test and post-test with Double Blind method. There were two groups in the study that each group was an intervention group with 4 grams of cocoa powder per day and the control group received a placebo capsule containing 4 grams of flour where each capsule contained 1 gram. Research starts from July 2017 to September 2017.

### **The Research Subject**

The sample of the study was male with age 25-55 years old, abdominal circumference  $\geq 90$ cm which fulfilled criteria taken based on consecutive sampling method. The Intervention and Control group each consisted of 17 subjects given a capsule of the same color and weight.

### **Method of Collecting Data**

The resulted data are respondent characteristic data by direct interview method on respondent by using household questionnaire, while in assessing body weight used TANITA digital scale, measuring waist circumference using One Med tape measure and viscera fat measurement using BIA (Bio Impedance Analysis).

## Data Analysis

The results will be processed and tested statistically by using SPSS 21 program. The data scale in the research is the ratio. Thus, looking at changes in before and after intervention in each group was analyzed by using statistical test t test. With meaning limit  $\alpha = 0.05$ . To see the difference before and after handling between the intervention group and the control group was used the Repeated ANOVA test and the Freidman test if the data were not normally distributed. To see the average difference of each group using independent t test and Man Whitney test if the data is not normally distributed.

## RESULT

Table 1. Distribution of Social Demographic Characteristic in Research Subjects

Variable	Intervention		Control		Total	
	n = 17	%	n = 17	%	n = 34	%
<b>Age</b>						
26-35 years	5	29.4	6	35.3	11	32.4
36-45 years	6	35.3	2	11.8	8	23.5
46-55 years	6	35.3	9	52.9	15	44.1
<b>Tribe</b>						
Makassar	13	76.4	10	58.8	23	67.4
Bugis	2	11.8	5	29.4	7	20.6
Toraja	2	11.8	-	0.0	2	5.9
Mandar	-	0.0	1	5.9	1	3.05
Jawa	-	0.0	1	5.9	1	3.05
<b>Income</b>						
≤ 5 juta	12	70.6	15	88.2	27	79.4
> 5 juta	5	29.4	2	11.8	7	20.6
<b>Education</b>						
Junior HS	1	5.9	2	11.8	3	8.8
Senior HS	5	29.4	4	23.5	9	26.5
Bachelor	10	58.8	7	41.2	17	50.0
Master	1	5.9	4	23.5	5	14.7

Based on Table 1 shows that the age of most research subjects was 46-55 years age group of 44.1% with the most tribal

origin being Makassar with 67.4%. Most subjects have an income of ≤5 Million Rupiah of 79.4%. Based on the level of education of most research subjects is S1 graduate with a percentage of 50%.

Table 2 shows that there was a decrease in mean of weight in both groups, both the intervention group and the control group, which can be seen from the mean changes of each group. The result waist circumference, indicating a significant difference between before and after intervention in the intervention group ( $p = 0.003$ ) and control group ( $p = 0.029$ ). However, the decrease in waist circumference in the intervention control group was higher than in the control group. Visceral fat visions indicate no significant difference between before and after intervention in the intervention group ( $p = 0.059$ ) and control group ( $p = 0.382$ )

Table 2 Comparison Analysis of Weight, Waist Circumference, Physical Function between the groups

Variable	Pre Test Mean±SD	Post Post Mean±SD	Δ Mean±SD	P Value
<b>Weight</b>				
Intervention(n=17)	77.98 ± 7.66	77.10 ± 7.68	- 0,87±1,97	0.085
Controls (n=17)	81.34 ± 10.45	80.68 ± 10.70	- 0,65±1,61	0.113
P Value	0.294	0.271	0.719	
<b>Waist Circumference</b>				
Intervention(n=17)	101 ± 6.52	98.91 ± 6.92	-2.09 ± 2.47	0.003
Controls (n=17)	101.75 ± 7.54	100.49 ± 7.85	-1.26 ± 2.16	0.029
P Value	0.758	0.538	0.305	
<b>Visceral Fat</b>				
Intervention (n=17)	13.88 ± 2.59	13.59 ± 2.45	-0.29 ± 0.59	0.059
Controls (n=17)	15.06 ± 2.63	14.88 ± 3.02	-0.18 ± 0.81	0.382
P Value	0.199	0.180	0.631	

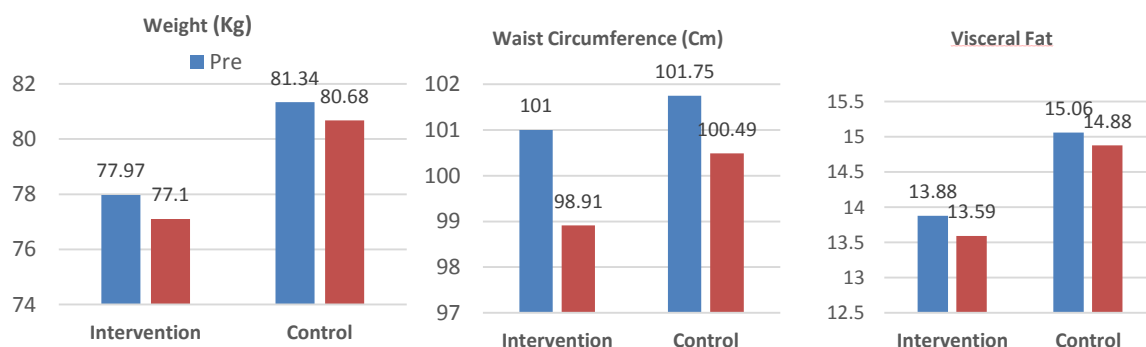


Figure1. Changes in Weight, Waist Circumference and Visceral fat variables during the study period.

Figure 1 showed a decrease in Body Weight, Waist Circumference and Visceral Fat was higher in the intervention group compared with the control group.

## DISCUSSION

Obesity is caused by excess energy stored in the form of fatty tissue. [16] Foods consumed daily have the content of micronutrients and macronutrients. Makronutrien which consists of carbohydrates, proteins and fats that serves as a major energy source in cell metabolism for daily activity needs. If the macronutrients are excessive, they will be metabolized and stored as food reserves by the body in the form of fat, either in liver tissue, muscle, bone marrow and in adipose tissue under the skin and internal organs for use at any time. [17,18] The Polish National Multi-centre Health Survey (WOBASZ) demonstrated that the mean flavonoid intake in the Polish population was 1 g/person/day. [19]

High energy intake in foods with solid form will be difficult to digest, so it can gain weight, because the substances of micronutrients contained only a little, other than that solid food with high content of sugar and fat. Energy in the body can arise because of the burning of carbohydrates, proteins, and fats, so that sufficient energy needs adequate and balanced food intake. [18,20]

In this study, changes in body weight were not significant after 8 weeks of cocoa capsule, both in the intervention group and in the control group. There was a weight loss in each group but changes in the intervention group were greater than the control group.

In obese with enlarged adipocyte size (hypertrophy) but fat cells have limited capacity to expand. As the fat cell enlarges until the critical volume of adipocytes breaks out which is caused by pressure. In addition, adipocyte enlargement will also lead to reduced oxygen supplementation resulting in hyposia and dead adiposity will activate the inflammatory signalling

pathway further releasing the cytokine. [21] Our results are in agreement with those of Matsui et al whom demonstrated that cacao intake during three weeks, leads to lower body weight and adipose tissue weight in male Wistar rats, by suppressing fatty acid synthase and other liver enzymes required for fatty acid synthesis. [22]

Antioxidants are known to lose weight through increased leptin efficiency and decreased inflammatory mediators. Leptin is a hormone that controls appetite and regulates body weight through brain receptors. [23] Increased leptin levels in obese people are associated with decreased leptin's ability to suppress incoming foods and suppress weight gain is a condition known as leptin resistance. The levels of leptin in adipose cells can serve as an indicator of how efficiently leptin works in keeping homeostatic energy. The efficiency of leptin is the level of leptin produced in adipose cells capable of maintaining homeostasis energy through weight regulation. [24]

The results of waist circumference analysis showed that there was a significant change after being given an 8 week cocoa capsule for the intervention group. While for the control group there was decreased waist circumference but it is not statistically significant. This waist-lowering mechanism may be due to the anti-oxidant content found in cocoa. This is similar to a 2014 Kristanti study that found that many antioxidant grape extracts prevented the rise in abdominal fat in experimental mice fed high-carbohydrate and fat diets. In the study mentioned that grape extract can prevent the weight of abdominal fat through several mechanisms. [25] One of them is by affecting adipocyte life cycle, decreasing synthesis, accumulation and viability. [19]

Research shows that waist circumference is a predictor of cardiovascular disease and metabolic disease. Waist circumference correlates both with BMI and total body fat, and is associated also with cardiovascular risk. [26] The prospective study of the Honolulu Heart

Study showed that the risk of Coronary Heart Disease (CHD) was found to be higher in the central obese group than the non-obese central obese with the BMI >25kg/m<sup>2</sup>. Several factors associated with obesity include environmental and social factors, neurological and endocrine disorders, lifestyle factors, high-fat dietary intake, excessive food consumption, age, psychological / stress factors, smoking behavior, and alcohol consumption. [27]

The most common and most practical method of assessing body composition used in the field is bioelectrical impedance analysis (BIA). BIA measurements are performed by placing the sole of the foot on the device so that a weak electric current can pass through the body. Another interesting aspect of BIA technology is probably the only body composition technique that has been directly marketed to the general public. [28]

Based on the research, there was a decrease of viscera fat viscosity in the intervention group and control group. Visceral fat is located in the intra-abdominal or in the abdomen and serves as a lining of internal organs. [29] One of the characteristics of abdominal obesity or visceral fat is the enlargement of fat cells, so the fat cells will secrete metabolic products, including proinflammatory cytokines, procoagulants, inflammatory peptides, and angiotensinogen. [30] The products of fat cells and the increase of free fatty acids in plasma are responsible for various metabolic diseases such as diabetes, heart disease, hyperlipidemia, gout, and hypertension. [31]

## CONCLUSIONS AND RECOMMENDATIONS

In the study, a person who consumed extract Theobroma Cacao L 4 grams per day for 8 weeks in central obese patients benefit for reduced body weight, waist circumference and visceral fat. There is a need for dose variation in subsequent studies to look for more effective effects

that can be recommended in the management of obesity.

## ACKNOWLEDGEMENT(S)

The authors are thankful to graduate school of Universitas Hasanuddin, Department of Nutrition School of Public Health Universitas Hasanuddin, Department of Nutrition School of Medicine, Universitas Hasanuddin, We also thank to all the respondents in our study.

## REFERENCES

1. World Health Organization (WHO).2015. World Health Statistic 2015
2. Bastard JP, Maachi M, Lagathu C, Kim MJ, Caron M, Vidal H, et al. 2006. Recent advances in the relationship between obesity, inflammation, and insulin resistance. *Eur Cytokine Network*. 17 (1): 4-12
3. Tsai CJ, Leitzmann MF, Willett WC, Giovannucci EL. 2006. Weight cycling and risk of gallstone disease in men. *Arch Intern Med* ;166(21): 2369-74.
4. Health Survey for England (HSE).2016. Survey Consultation Report. Published 11 November 2016
5. World Health Organization (WHO). 2013. A global brief on Hypertension: silent killer, global public health crises (World Health Day 2013). Geneva: WHO. 2013.
6. Badan Penelitian Dan Pengembangan Kesehatan (Balitbangkes) Depkes. 2007. Riset Kesehatan Dasar. Jakarta: Balitbangkes Depkes, 2007.
7. Badan Penelitian Dan Pengembangan Kesehatan (Balitbangkes) Depkes. 2013 Riset Kesehatan Dasar. Jakarta: Balitbangkes Depkes, 2013
8. Bohannon Johannes. 2015. Chocolate With High Cocoa Content As A Weight-Loss Accelerator. *International Archives Of Medicine*. Vol. 8 No. 55.
9. Golomb BA, Koperski S, White HL. Association Between More Frequent Chocolate Consumption and Lower Body Mass Index. *Arch Intern Med*. 2012; 172(6): 519-521.
10. Ditejnbun, 2010. Kakao. Statistik Perkebunan. Direktorat Jendral Perkebunan Jakarta.
11. Agus Sudiby. 2012. Peran Cokelat Sebagai Produk Pangan Derivat Kakao Yang

- Menyehatkan. *Jurnal Riset Industri* Vol. Vi No. 1, 2012.
12. Majewska-Wierzbicka M., Czeczot H.: Flavonoids in the prevention and treatment of cardiovascular diseases. *Pol Merk Lek* 2012; 32:50-54.
  13. Sies H, Schewe T, Heiss C, Kelm M. Cocoa Polyphenols And Inflammatory Mediators. *Am J Clin Nutr* , 2005;81(Suppl):304s–12s.
  14. Mao,T.K.et al. Cocoa Flavonols And Procyanidins Promote Transforming Growth Factor-Homeostasis In Peripheral Blood Mononuclear Cells.2012. Society For Experimental Biology And Medicine.
  15. Beekmann K, Actis-Goretta L, van Bladeren PJ, Dionisi F, Destailats F, Rietjens IM. A state-of-the-art overview of the effect of metabolic conjugation on the biological activity of flavonoids. *Food Funct.* 2012; 3 (10): 1008-1018.
  16. World Health Organization (WHO).2000 Obesity: Preventing And Managing The Global Epidemic,2000
  17. Wilborn Colin, Et Al .2005. Obesity: Prevalence, Theories, Medical Consequences, Management, And Research Directions. *Journal Of The International Society Of Sports Nutrition.* 2(2): 4-31.
  18. World Health Organization. 2003 Global Strategy On Diet, Physical Activity And Health
  19. Zujko M.E., Witkowska A.M., Waskiewicz A., Sygnowska E.: Estimation of dietary intake and patterns of polyphenolconsumption in Polish adult population. *AdvMed Sci*2012;57(2):375-384.
  20. Gandy, W.Joan., Madden, A., Holdsworth, M. (2014) *Gizi dan Dietetika*. Jakarta: EGC
  21. Demerath EW et al. 2007. Anatomical patterning of visceral adipose tissue: race, sex, and age variation. *Obesity.* 15:2984-2993.
  22. Matsui N, Ito R, Nishimura E, Yoshikawa M, Kato M, Kamei M et al. Ingested cacao can prevent high-fat dietinduced obesity by regulating the expression of genes for fatty acid metabolism. *Nutr.* 2005; 21 (5): 594-601.
  23. Hughes LA, Arts IC, Ambergen T, Brants HA, Dagnelie PC, Goldbohm Raet Al. Higher Dietary flavone, flavonol, And Catechin Intakes Are Associated With Less Of An Increase In BMI Over Time In Women: A Longitudinal Analysis From The Netherlands Cohort Study. *Am J Clin Nutr* 2008;88:1341–52.
  24. Atho'illah,M.Fitri, Umi Lestatri, Sri Rahayu Lestari.2013. Peningkatan Efisiensi leptin pada lemak Visceral tikus percobaan *Rattus novergicus*) dengan menggunakan Ekstrak kulit Rambutan (*Nephelium Iappaceum*).
  25. Kristanti, Larissa.2014. Pemberian Ektrak Anggur (*Vitis Vinifera*) Oral Mencegah Kenaikan Berat Badan dan Lemak Abdominal pada Tikus Wistar jantan yang diberi diet Tinggi karbohidrat dan Lemak. Tesis. Program Pascasarjana. Universitas Udayana.Denpasar.
  26. Shen Wei, Et Al. 2006. Waist Circumference Correlates With Metabolic Syndrome Indicators Better Than Percentage Fat. *Obesity (Silver Spring).* 14(4): 727–736.
  27. Mukherjee B, Hossain CM, Mondal L, Paul P, and Ghosh MK. Review: obesity and insulin resistance: an abridged molecular correlation. *Lipid Insights.* 2013;6:1–11
  28. Andrea C. Buchholz, PhD, RD; Cynthia Bartok, PhD, RD; and Dale A. Schoeller, PhD. The Validity of Bioelectrical Impedance Models in Clinical Populations Department of Nutritional Sciences, University of Wisconsin–Madison. Vol. 19, No. 5
  29. Tchernof Andre And Jean-Pierre Despres, 2013. Pathophysiology Of Human Visceral Obesity: An Update. *Physiol Rev* 93: 359–404.
  30. Martins IS, Marinho SP. 2003. The potential of central obesity antropometric indicators as diagnostic tools. *Rev Saúde Pública.* 37(6)
  31. M. Azzaky Bimandama Dan Tri Umiana Soleha.2016. Hubungan Sindrom Metabolik Dengan Penyakit Kardiovaskular. Majority Volume 5 Nomor 2

How to cite this article: Rahman SN, Citrakesumasari, Taslim NA. Effect of cocoa on body weight, waist circumference and visceral fat patient with central obesity. *International Journal of Science & Healthcare Research.* 2018; 3(1): 45-47.

\*\*\*\*\*