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Effectiveness of Steamed Brownies Base on Fermented Black Glutinous Rice on Decreased Waist Circumference in Abdominal Obesity

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ABSTRACT
Consumption of fiber and anthocyanins can decrease waist circumference and weight by lowering body fat levels. Steamed brownies base on fermented black glutinous rice is one of the cereals with high antioxidants, bioactive compounds, and fiber. The purpose of this research is to determine the effect of the effectiveness of steamed brownies based on fermented black glutinous rice on decreased waist circumference in abdominal obesity. The design of this research was experimental using two groups pre and post-test with control experimental design. The population in this research was adult women (35-50 years) in Pasirkaliki Village, North Cimahi Subdistrict, Cimahi City, with 40 samples. The intervention group was given steamed brownies base on fermented black glutinous rice, one puck (30 grams), and low-calorie diet education. The control group was given a low-calorie diet education. Statistical tests with the Wilcoxon Sign Rank test showed that there was a significant difference in waist circumference decreased at the beginning and the end of the research with p-value <0,001. Mann-Whitney test showed that there was an effect in steamed brownies base on fermented black glutinous rice giving to decrease waist circumference with p-value < 0,001. Steamed brownies base on fermented black glutinous rice can be as an alternative food for decreasing waist circumference.
Keywords: *steamed brownies based on fermented black glutinous rice; waist circumference; abdominal obesity*

ABSTRAK
Konsumsi serat dan antosianin membantu menurunkan lingkar pinggang dan berat badan dengan menurunkan kadar lemak tubuh. Tape ketan hitam salah satu serealia dengan antioksidan, senyawa bioaktif, dan serat. Tape ketan hitam ini dapat diolah menjadi berbagai macam makanan seperti brownies kukus tape ketan hitam. Tujuan penelitian untuk mengetahui Efektifitas Pemberian Brownies Tape Ketan Hitam terhadap Penurunan Lingkar Pinggang pada Obesitas Abdominal. Desain penelitian eksperimental menggunakan two group pre and post test with control experimental design. Populasi ialah perempuan dewasa (35-50 tahun) di Kelurahan Pasirkaliki Kecamatan Cimahi Utara Kota Cimahi. Jumlah

sampel 40 orang. Penelitian dilakukan selama 30 hari. Kelompok intervensi diberi Brownis kukus tape ketan hitam 1 potong (30 gram) dan edukasi diet rendah kalori. Kelompok kontrol diberi edukasi diet rendah kalori. Uji statistik dengan Wilcoxon Sign Rank Test menunjukan terdapat perbedaan lingkar pinggang secara bermakna pada awal dan akhir penelitian dengan nilai p<0,001 (p≤0,05). Uji statistik dengan Mann Whitney Test menunjukan terdapat pengaruh pemberian brownis kukus tape ketan hitam terhadap penurunan lingkar pinggang dengan nilai p<0,001 (p≤0,05). Brownies kukus tape ketan hitam dapat menjadi makanan alternatif pangan untuk menurunkan lingkar pinggang.
Kata kunci : brownies kukus tape ketan hitam; lingkar pinggang; obesitas abdominal

INTRODUCTION

Obesity is an accumulation of abnormal or excessive fat that can interfere with health. The prevalence of obesity is increasing worldwide (WHO,2016). Based on the 2013 Basic Health Research data, the percentage of overweight and obesity at the age of> 18 years according to the BMI category in West Java was 26.9%, and Cimahi City was 32.1%. The percentage of obesity according to the Waist Circumference indicator of Cimahi city was 34.4%, this percentage was higher than the percentage of West Java, which was 26.4% (Balitbangkes RI, 2013). Obesity is caused by the wrong diet (excessive food intake) by consuming high carbohydrates simple, high fat, and low in fiber and imbalanced nutrition (Burhan et al., 2013). Someone who has high fat intake has a 4.4 times higher risk of being overweight (Kharismawati, 2010).

Consuming fiber can help weight loss, where foods that contain high levels of fiber usually contain low calories (Harikedua and Tando, 2012). High fiber food will stay longer in the stomach. There is a slowdown in gastric emptying after consumed high fiber food (Beck, 2011). Subjects with lower levels of fiber intake have a four times greater risk of being obese (Kharismawati, 2010). According to the Ministry of Health of the Republic of Indonesia in 2013, the average number of fiber sufficiency for adults aged 19-64 years in Indonesia is 36.3 gr/day for men and 30 gr/day for women (Kemenkes RI, 2013). Anthocyanins are absorbed into the blood in their intact form and metabolized to methoxy derivatives in the liver and kidneys. Anthocyanin then activates AMPK (Adenosine Monophosphate-Activated Protein Kinase), which is induced by significant phosphorylation of ACC (Anti-AcetylcoA Carboxylase) and regulated by PPARα (Peroxisome Proliferator-Activated Receptor α) and ACO (Acetyl-CoA Carboxylase) in the

liver thereby increasing fat content through increased fatty acid oxidation. Based on research conducted by Tsuda (2003) in rats that were intentionally made to become obese by being given a high-fat diet, explained that the consumption of anthocyanins from food (purple corn) could significantly prevent obesity and diabetes (Tsuda,2003). According to research conducted prior to mice, anthocyanin extract from blueberries, if added as a supplement, can significantly inhibit weight gain and accumulation of body fat (Prior et al., 2008).

Fermented Glutinous Black Rice is one of the potential commodities as a source of carbohydrates, antioxidants, bioactive compounds, and fiber, which are important for health (Nailufar et al., 2012). One of the products developed from the Steamed Brownies Base on Fermented Black Glutinous Rice is a Steamed Brownies. Processing does not have much effect on anthocyanin levels. Therefore, researchers are interested in knowing the effect of steamed brownies base on fermented black glutinous rice on decreasing waist circumference and weight in obese adults in Cimahi City.

METHOD

The research design used was experimental using two groups pre and post-test with experimental design control. This study divides the sample into 2 sample groups, namely, intervention and control group. In the intervention group, there was one piece of Steamed Brownies Base on Fermented Black Glutinous Rice (30 grams) for 30 days with a frequency of 1 time a day and education on a low-calorie diet, while for the control group were only given a low-calorie diet. At the beginning and end of the study, both groups of samples were measured waist circumference and body weight. The study was conducted on adult individuals (30-50 years) in RW 03 and RW 10 Pasirkaliki Village, Cimahi Utara District, Cimahi City. The inclusion criteria for both sample groups were 30-50 years old, overweight with BMI> 25.0 kg / m2, female sex, and willing to take part in the study and sign informed consent forms. In contrast, the exclusion criteria were pregnant, sick, and athlete.

Analysis of sample characteristics data (age, education, occupation, and physical activity) is presented in the form of a frequency distribution table that displays the number and percentage, then analyzed descriptively. BMI data, energy intake data, fat intake data, and fiber intake data are presented in the form of distribution

tables showing the average, standard deviation, median, maximum, and minimum value.

RESULTS AND DISCUSSION

Characteristics of subjects based on age, gender, education, occupation, Body Mass Index (BMI), energy intake, and fiber intake between intervention and control explained in Table 1.

Table 1. Characteristics of subjects intervention and control group

Variable	Intervention (n=20)				Control (n=20)				p value
	Average	SD	n	%	Average	SD	n	%	
Age	43,05	7,23			42,25	7,21			0,728*)
Gender									1,000**)
Female			20	100,0			20	100,0	
Education									0,182**)
SD			8	40,0			6	30,0	
SMP			9	45,0			7	35,0	
SMA			2	10,0			7	35,0	
Diploma			1	5,0			0	0,0	
Occupation									0,890**)
Housewife			16	80,0			15	75,0	
Employee			2	10,0			3	15,0	
Entrepreneur			2	10,0			2	10,0	
Energy Intake	54,08	25,54			59,23	16,87			0,457*)
Fiber Intake	44,20	14,73			38,17	14,64			0,202*)

*) *Independent T test* **) *Chi Square test*

Overweight occurs in adulthood because the amount of fat deposits in an adult's body has increased by 10 percent. Changes in a person's lifestyle have contributed to an increase in body fat (Beck, 2011). This is in line with the research conducted by Nadimin et al. in 2015, which stated that age is one of the causes of obesity in adults with a total sample age of> 25 years (Nadimin et al., 2015). Based on the results of the study, it is known that most of the samples were housewives in the intervention group (80.0%) and the control group (70.0%). Housewives have a physical activity that is not too heavy, so they tend to be overweight. Physical activity is known to be one of the factors of obesity(O'Dea and Wilson, 2006). Technological advancements that are progressing from year to year provide convenience to lifestyle and reduce the number of physical activities in daily activities, including domestic work (Budianto, 2009).

This research is in line with the study conducted by Aprianty (2015), which states housewives have a 5.5 times risk of becoming obese because they have low activity. Some of the samples in the intervention group had the last education in were junior high (45%), and in the control group, some had junior high school (35.0%).

The mean percent of energy intake in the intervention group was 54.08%, and in the control group, 59,23%. The average energy intake in both groups was in the homogenous diet low calorie. Based on the results of statistical tests using the Mann-Whitney Test obtained p-value = 0.4577 (p> 0.05) or it can be said that there is no significant difference between the intervention group and the control group or homogeneous data. So, the sample energy intake does not affect the research. The statistical test used is Mann Whitney Test on 95% confidence level shows that there is a significant difference in mean fiber intake at the beginning and end of the study in each group, in the intervention group and the control group with p=0.202 (p>0.05). There was no difference in the increase in fiber intake between the intervention group and the control group. This shows that dietary fiber intake does not affect research.

Table 2. Comparison of body mass index between intervention and control group

Variable	**Intervention (n=20)**		**Control (n=20)**		**p-Value**
	Average	SD	Average	SD	
BMI Pre	29,03	2,54	30,39	3,79	0,188*)
BMI Post	27,68	2,62	29,98	3,89	0,034*)
Decreased BMI	1,35	0,74	0,40	1,28	0,007*)

*)Mann Whitney test

Table 2 shows that the results of statistical tests using the Mann Whitney test at a 95% confidence level indicate that there were significant differences in the initial Body Mass Index (BMI) between the intervention and control groups with p-value 0.188 (p>0.05). There is a significant difference in the final Body Mass Index (BMI) between the intervention and the control group with p-value 0.034 (p≤0.05). BMI is a simple tool for monitoring the nutritional status of adults, especially those related to deficiency and being overweight (Supariasa et al. 2016). BMI measurements are more sensitive in assessing the distribution of fat in the body, especially those in the abdominal wall

(Fahmida,2007). BMI can be a simple indicator to monitor weight loss and distribution of body fat, especially in the abdomen. The results of statistical tests using the Mann Whitney test at a 95% confidence level indicate that there is a significant difference in Body Mass Index (BMI) between intervention and control groups with p-value 0.007 ($p \leq 0.05$). According to the WHO Asia-Pacific perspective guidelines, the cut-off point for abdominal obesity is waist circumference ≥90 cm for men and ≥80 cm for women (Alselevany, 2014).

Table 3. Comparison before and after waist circumference in the intervention group

Variable	**Intervention Group**				**p-value** *)
	Before		**After**		
	Average	**SD**	**Average**	**SD**	
Waist Circumference (cm)	93,71	3,18	89,02	2,86	<0,001

*) *Wilcoxon Sign Rank Test*

Table 3 shows that the results of statistical tests using the Wilcoxon Sign Rank Test at a 95% confidence level indicate that there is a significant difference in waist circumference between before and after giving of Steamed Brownies Base on Fermented Black Glutinous Rice with p-value <0.001 ($p \leq 0.05$).

Table 4. Comparison before and after waist circumference in the control group

Variable	**Control Group**				**$p_{\text{-value}}$** *)
	Before		**After**		
	Average	**SD**	**Average**	**SD**	
Waist Circumference (cm)	92,24	3,38	91,04	3,34	0,001

*) *Wilcoxon Sign Rank Test*

Table 4 shows that the results of statistical tests using the Wilcoxon Sign Rank Test at a 95% confidence level indicate that there is a significant difference in waist circumference between before and after in the control group with $p_{\text{-value}}$ 0.001 ($p \leq 0.05$).

Table 5. Comparison of initial waist circumference between intervention and control group

Variable	Intervention		Control		$P_{\text{-Value}}$ *)
	Average	SD	Average	SD	
Initial Waist Circumference (cm)	93,71	3,18	92,24	3,38	0,157

*) *Mann Whitney Test*

Table 5 shows that the results of statistical tests using the Mann Whitney Test at a 95% confidence level indicate that there was no significant difference in the initial waist circumference between the intervention and control group with $p_{\text{-value}}$ 0.157 ($p > 0.05$).

Table 6. Comparison of the final waist circumference between intervention and control group

Variable	Intervention		Control		$p_{\text{-Value}}$ *)
	Average	SD	Average	SD	
Final Waist Circumference (cm)	89,02	2,86	91,04	3,34	0,048

*) *Mann Whitney Test*

Table 6 shows that the results of statistical tests using the Mann Whitney Test at a 95% confidence level indicate that there is a significant difference in the final waist circumference between intervention and control group with $p_{\text{-value}}$ 0.048 ($p \leq 0.05$).

Table 7. Effectiveness of Steamed Brownies Base on Fermented Black Glutinous Rice on decreased waist circumference in abdominal obesity

Variable	Intervention		Control		$p_{\text{-value}}$
	Average	SD	average	SD	
Decreased Waist Circumference (cm)	4,69	1,17	1,19	0,90	<0,001

*) *Mann Whitney Test*

Table 7 shows that the mean reduction in waist circumference in the intervention group was 4.69 cm with a standard deviation 1.17 higher than the mean reduction in waist circumference in the control group was 1.19 cm with a standard deviation of 0.90. Statistical test results using Mann Whitney Test at a 95% confidence level indicate that there is a significant difference in waist circumference between intervention and a control group with p-value <0.001 ($p \leq 0.05$), it means the effectiveness of Steamed Brownies Base on Fermented Black Glutinous Rice to decreased waist circumference in abdominal obesity.

Table 8. Effectiveness of Steamed Brownies Base on Fermented Black Glutinous Rice on decreased waist circumference in abdominal obesity by considering other factors.

Variable	**B**	**SE**	**r**	**R^2**	**P_{-Value} *)**
Before			0,87	0,76	<0,001
Giving Steamed Brownies Base on Fermented Black Glutinous Rice	-3,431	0,337			<0,001
Education	-0,345	0,206			0,102
Fiber Intake	-0,004	0,012			0,750
Constant	8,907				
After			0,87	0,76	<0,001
Giving Steamed Brownies Base on Fermented Black Glutinous Rice	-3,411	0,327			<0,001
Constant	8,703				

*) *Multiple Linear Regression Test*

Table 8 shows that the results of statistical tests indicate that there is a significant effect on the effectiveness of Steamed Brownies Base on Fermented Black Glutinous Rice on decreased waist circumference in abdominal obesity by considering other factors such as education and fiber intake. The multivariable analysis candidate test with p_{-value} <0.001 with a beta coefficient of 3.411 and coefficient correlation of 0.87 with very strong criteria and an R^2 value of 0.76 which indicates that the decreased waist circumference in abdominal obesity is influenced by giving Steamed Brownies Base on Fermented Black Glutinous Rice by 76% and 24% influenced by other factors.

Based on the results of this study, it is known that the sample with age <40 years experienced a decrease in waist circumference averaging 5.9 cm while for samples with age ≥40 years experienced a decrease in waist circumference averaging 4.9 cm. Increases in waist circumference occur in tandem with the aging process, even without weight gain (Stevens et al., 2010). This occurs due to changes in physiological function in the age group of 20 to 64 years who experience an increase in body weight and fat tissue. Conversely, there is a decrease in muscle mass, which causes a redistribution of fat in the body, with reduced subcutaneous fat and accumulation of fat in the abdominal cavity, thus affecting the incidence of central obesity (Brown, 2011).

Based on a statistical result, there was no significant difference in mean weight at the beginning and end of the study in the control group. In contrast, the waist

circumference variable in the same group showed significant mean differences at the beginning and end of the study. This research is not in line with the research conducted by Meidelwita (2010), which shows that based on statistical tests, it was found that there were significant differences between body weight before and after a low-calorie balanced diet with aerobic physical exercise. This can occur due to the physical activity of the sample, which tends to be mild. Bodyweight describes the amount of protein, fat, water, and minerals found in the body (Par' i, 2015). Waist circumference is used to predict the presence of fat deposits in the intra-abdominal region or often called central obesity (Coulston et al., 2013). Thus, it can be said that bodyweight describes the composition of the entire body, while the waist circumference only describes the distribution of fat in the abdomen. Low-calorie diet education is less effective for weight loss because of a longer reduction compared to waist circumference. The results of this study are following Heysmfield et al. report that weight loss will be slower due to fat oxidation takes longer than the time to oxidize carbohydrates and proteins (Heymsfield et al., 1989).

This study is in line with research conducted prior to mice. Anthocyanin extract from blueberries, if added as a supplement, can significantly inhibit weight gain and accumulation of body fat (Prior et al., 2008). However, this study was carried out on humans, and sources of anthocyanins were obtained from Fermented Glutinous Black Rice. In this study, it was discovered that after a sample of Steamed Brownies Base on Fermented Black Glutinous Rice felt full longer and slightly bloated. It is known that fermented glutinous black rice is a product of alcoholic fermentation (Yustina I, 2011). The dominant phenolic components detected in fermented glutinous black rice are anthocyanin compounds and other elements such as fiber (Yanuwar, 2009).

Anthocyanin is known to increase fat levels by increasing the oxidation of fatty acids (Takikawa, 2010). Thus, there is a decrease in body fat levels faster than with the control group as a result of weight loss, and the results of data analysis showed the mean weight loss of the intervention group was 1.30 kg. The effects of satiety are produced from consuming Steamed Brownies Base on Fermented Black Glutinous Rice to fiber and fermentation. The fiber contained in Steamed Brownies Base on Fermented Black Glutinous Rice is a type of insoluble food fiber. Fiber can provide full effects for longer so that losing weight and being overweight can be

avoided (Groff et al., 2005). A slowdown in gastric emptying causes a person to feel full after eating and thus eat less. Fiber also, resulting in a lot of stool mass and soft (because it contains water), one of which is an increase in the frequency of defecation and a reduction in colonic transit time (Beck, 2011). The increasing frequency of defecation and decreased frequency of eating due to longer satiety caused weight loss in the intervention group who were given Steamed Brownies Base on Fermented Black Glutinous Rice and educated low-calorie diet.

CONCLUSION

There is an effect of Steamed Brownies Base on Fermented Black Glutinous Rice on decreasing waist circumference. It is necessary to socialize the importance of consuming Steamed Brownies Base on Fermented Black Glutinous Rice, an alternative functional food to prevent obesity by reducing waist circumference. Further research is needed on the relationship between consumption of Steamed Brownies Base on Fermented Black Glutinous Rice with a decrease in waist circumference paying attention to confounding factors such as food intake and physical activity, longer treatment times and paying attention to impressions after consuming of Steamed Brownies Base on Fermented Black Glutinous Rice. Develop Steamed Brownies Base on Fermented Black Glutinous Rice products as a snack option to prevent obesity, accompanied by a low-calorie diet is needed.

REFERENCE

Adriani M, Wirjatmadi B. 2012. *Pengantar Gizi Masyarakat*. Edisi 1, Cetakan 1. Jakarta: Kencana Prenada Media Group.

Alselevany, Baybeen K. 2014. Effect of central Obesity on some Pulmonary Function Tests in women. *World Journal Of Pharmacy and Pharmaceutical Sciences*. Iraq: Department of Medical Physiology, College of Medicine, University of Mosul.

Aprianty L. 2015. Faktor Resiko Obesitas Ibu Rumah Tangga Di Kelurahan Bendungan Kecamatan Gajahmungkur Kota Semarang. *Skripsi*. Semarang: Program Studi Ilmu Gizi Fakultas Kedokteran Universitas Diponogoro.

Asiah N. 2009. Pengaruh Diet Rendah Kalori Seimbang Terhadap Resting Energy Expenditure, Respiratory Quotient dan Profil Lipid Serum Perempuan Obes. *Skripsi*. Sumedang : Bagian Ilmu Gizi Fakultas Kedokteran Universitas Padjadjaran. Available from: https://www.researchgate.net/

Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan

RI. 2013. *Riset Kesehatan Dasar 2013*. Jakarta :Kementerian Kesehatan Republik Indonesia. Available from: http://www.depkes.go.id/

Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan RI. 2013. *Riset Kesehatan Dasar Dalam Angka Provinsi Jawa Barat 2013*. Jakarta: Kementerian Kesehatan Republik Indonesia. Available from : http://terbitan.litbang.depkes.go.id/

Beck M E. 2011. *Ilmu Gizi dan Diet Hubungannya dengan Penyakit-Penyakit untuk Perawat dan Dokter*. Yogyakarta: Penerbit Andi Yogyakarta.

Budianto. 2009. Dasar-dasar Ilmu Gizi. Cetakan keempat. Malang:UMM Press.

Brown, et al. 2011. *Nutrition Through the Life Cycle* (4 ed). USA: Wadsworth, Cengage Learning.

Burhan F Z, Sirajuddin S, Indriasari R. 2013. Pola Konsumsi Terhadap Kejadian Obesitas Sentral Pada Pegawai Pemerintahan Di Kantor Bupati Kabupaten Jeneponto. *Skripsi*. Makasar : Program Studi llmu Gizi Fakultas Kesehatan Masyarakat Universitas Hasanudin. 2013. Available from: http://www.repository.unhas.ac.id/

Coulston A.M, Boushey C, Feruzzi M. 2013. *Nutrition in the Prevention and Treatment of Disease*. San Fransisco: Academic Press, Massachussets.

Fahmida D. 2007. *Handbook nutritional assessment*. Jakarta: SEAMEO-TROPMED RCCN UI; 2007. Available from: https://jurnal.ugm.ac.id/

Fauziyah N. 2015. Hubungan Konsumsi Tape Ketan Hitam Dengan Penceggahan Kejadian Sindroma Metabolik Pada Usia 40 Tahun Ke Atas Di Kabupaten Bandung Barat Provinsi Jawa Barat. *Disertasi*. Jakarta: Universitas Indonesia.

Fauziyah N. 2017. Studi Efikasi Pemberian Snack Bar Tinggi Antioksidan Dan Serat Berbasis Tape Ketan Hitam Terhadap Profil Lipida Darah Pada Penderita Dislipidemia. *Laporan penelitian*. Bandung: Poltekkes Bandung.

Groff J.L, Gropper S.S, Hunt S.M. 2005. *Dietary fiber: advanced nutrition and human metabolism*. 4thed. Los Angeles.

Harikedua V T, Tando N M. 2012. Aktifitas fisik dan pola makan dengan obesitas sentral pada tokoh agama di Kota Manado. *Jurnal Gizido*. 4(1): 289-298. Available from: http://download.portalgaruda.org/

Heymsfield SB, Casper K, Hearn J, Guy. 1989. Rate of weight loss during underfeeding: relation to level physical activity. *Metabolism*. 38(3):215-23.

Kharismawati R. 2010. Hubungan Tingkat Asupan Energi, Protein, Lemak, Karbohidrat, dan Serat dengan status Obesitas pada siswa SD. *Skripsi*. Semarang: Program Studi Ilmu Gizi Fakultas Kedokteran Universitas Diponogoro; 2010. Available from: http://eprints.undip.ac.id/

Kementerian Kesehatan Republik Indonesia. 2013. Angka Kecukupan Gizi Bagi Bangsa Indonesia. Jakarta:

Kementerian Kesehatan RI. Available from: http://gizi.depkes.go.id/

Meidelwita Y. 2010. Pengaruh Diet Rendah Kalori Seimbang dan Latihan Fisik Aerobik Terhadap Status Antropometri dan Tekanan Darah Perempuan Obes. *Artikel penelitian*. Padang : Stikes Mercubaktijaya Padang. 2010. Available from: https://maidelwita.files.wordpress.com/

Nadimin, Ayumar, Fajarwati. 2015. Obesitas Pada Orang Dewasa Anggota Keluarga Miskin Di Kecamatan Lembang Kabupaten Pinrang. *Jurnal MKMI*. 9-15. Available from: https://media.neliti.com/

Nailufar A A, Basito, Anam C. 2012. Kajian Karakteristik Ketan Hitam (*Oryza sativa glutinosa*) Pada Beberapa Jenis Pengemas Selama Penyimpanan. *Jurnal Teknosains Pangan*. 1 (1): 121-132.

O'Dea JA & Wilson R. 2006. Socio-cognitive and nutritional factors associated with body mass index in children and adolescents: possibilities for childhood obesity prevention. *Health Educ Res*. 21: 796-805. Available from: https://www.ncbi.nlm.nih.gov/

Par'i H M. 2015. *Buku Ajar Prinsip Dasar Penilaian Status Gizi*. Bandung: Kementerian Kesehatan RI Politeknik Kesehatan Bandung Jurusan Gizi.

Prior R L, Wu X, Gu L, Hager T J. Hager A, Howard L R. 2008. Whole berries versus berry anthocyanins: Interactions with dietary fat levels in the C57BL/6J mouse model of obesity. *Journal Agric Food Chem*. 56:647-653

Santawati F. 2010. Hubungan Asupan Serat Dengan Beberapa Factor Risiko Penyakit Kardiovaskular. *Artikel Penelitian*. Semarang: Universitas DiponegoroAvailable from: http://eprints.undip.ac.id/

Sirajudin dkk. 2015. *Survei Konsumsi Pangan*. Jakarta: EGC.

Stevens J, Katz EG, & Huxley R R. 2010. Associations between gender, age, and waist circumference. *Eur J Clin Nutr*. 64 (1): 6-15.

Supariasa I D N, Bakri B, Fajar I. 2016. *Penilaian Status Gizi*. Cetakan 1. Jakarta: EGC.

Takikawa, Masahito, Inoue, Seiya, Horio, Fumihiko, Tsuda, Takanori. 2010. Dietary Anthocyanin Rich Bilberry Extract Ameliorates Hyperglycemia and Insulin Sensitivity via activated of AMP-Activated Protein Kinase in Diabetic Mice. *The Journal of Nutrition*. 140: 527-533.

Tsuda, Takanori. 2003. *Dietary Cyanidin 3-O--D-Glucoside-Rich Purple Corn Color Prevents Obesity and Ameliorates Hyperglycemia in Mice.* International Journal. Research Center For Biomarkers Of Preventive Medicine. Japan: Doshisha University.

Widyakarya Pangan dan Gizi VIII. 2004. *Ketahanan Pangan dan Gizi di Era Otonomi Daerah dan Globalisasi*. Jakarta.

World Health Organization. Obesity and Overweight. 2016. Available from: http://www.who.int/mediacentre/

Yanuwar W. 2009. Aktivitas Antioksidan dan Imunomodulator Serealia Non Beras. *Thesis.* Bogor: Sekolah Pasca Sarjana Institut Pertanian Bogor; Available from: http://repository.ipb.ac.id/

Yustina I. 2011. Studi Pengaruh Lama Fermentasi Tape Ketan Hitam terhadap Kadar Antosianin dan Aktivitas Antioksidan. *Thesis*. Malang: Universitas Brawijaya