International Journal of Innovation Scientific Research and Review
Vol. 05, Issue, 02, pp.3955-3958, February 2023
Available online at http://www.journalijisr.com
SJIF Impact Factor 4.95

IJISRR

ISSN: 2582-6131

Research Article

THE COMPARISON OF POSTPRANDIAL TRIGLYCERIDE LEVELS AFTER CONSUMPTION OF WHITE TEA OR GREEN TEA IN BORDERLINE HYPERTRIGLYCERIDEMIA SUBJECTS

[1]Putri SaktiDwiPermanasari, [2,] *NinikMudjihartini, [3]Inge Permadhi

[1]Department of Nutrition, Faculty of Medicine, Universitas Indonesia, Salemba Raya 6, Central Jakarta, 10430, Indonesia.
[2]Department of Biochemistry and Molecular Biology, Faculty of Medicine, Universitas Indonesia, Salemba Raya 6, Central Jakarta, 10430, Indonesia.
[3]Department of Nutrition, Faculty of Medicine, Universitas Indonesia, Salemba Raya 6, Central Jakarta, 10430, Indonesia.

Received 12th December 2022; Accepted 13th January 2023; Published online 20th February 2023

ABSTRACT

Aims: The aim of this study is to evaluate the comparison effect of consumption high fat diet with white tea or green tea on post prandial serum triglyceride level. **Study design:** This study was clinical trial, random allocation, cross over and double blind. **Methodology:** We included twenty-three hypertriglyceridemia borderline subjects to completed this study. Each subject got twice treatment, which are consumption high fat diet with white tea or green tea. This treatment held in two days with three days for wash out period. Data obtained include subject characteristics, dietary assessment of energy and fat intake, fasting and post prandial serum triglyceride levels. **Results:** The mean age of subject is 32.96 ± 8.04 years with a mean BMI of subject is 26.23 ± 3.62 kg/m2, categorized in overweight and obese. Fasting serum triglyceride level didn't show significantly different (*P*=.079). The result from post prandial serum triglyceride levels from white tea group were significantly lower (231.43 ± 76.49 mg/dL, *P*=.024) than green tea group (273.61 ± 117.90 mg/dL). **Conclusion:** Consumption of white tea within 30 minutes of brewing time with the same dose, temperature and brewing time in subjects after a high-fat food intake resulted in lower post prandial triglyceride levels compared to green tea.

Keywords: Hypertriglyceridemia borderline, white tea, green tea, high fat diet, post prandial serum triglyceride level.

INTRODUCTION

The incidence of cardiovascular disease has become a global epidemic and causes number one of morbidity and mortality in the world as a result of atherosclerosis and thrombosis.[1,2]The risk of the disease reached 80% of the population in countries with low and middle income.[1,3,4] World Health Organization (WHO) show that in 2002 there have been 7.22 million people deaths from coronary heart disease and is expected to rise up to 11.1 million in 2020. [3]Dyslipidemia is a risk factor in cardiovascular disease that can be modified.[2] It is characterized by increased levels of Low Density Lipoprotein (LDL) or small dense LDL, hypertriglyceridemia, and decreased levels of High Density Lipoprotein (HDL).[2,5–7]The prevalence of hypertriglyceridemia in The US according to The National Health and Nutrition Examination Survey (NHANES) reached 31% from 1999 to 2008.[8]RisetKesehatanDasar (Riskesdas) in 2007 showed that the prevalence of dyslipidemia in Indonesia reached 39.8% while the prevalence of deaths from ischemic heart disease is 5.1% each year.[2,9]Procedures for the therapy and evaluation of hypertriglyceridemia are necessary because high levels of triglyceride may be involved in the development process of atherosclerosis.[8,10–12] Management of non-medical foremost is to implement lifestyle modifications however, studies showed that it is not easy to follow a lifestyle in accordance with Therapeutic Lifestyle Changes (TLC).[11,13]According to data from the SurveiSosialEkonomiNasional (Susenas) showed that Indonesia food intake tend to be high in calories and fat that is increasing from year to year.[14] Research by Nogaroto et al., showed that the effect of consume high fat diet may increase post prandial serum triglyceride levels.[15]

***Corresponding Author: NinikMudjihartini,**
Department of Biochemistry and Molecular Biology, Faculty of Medicine, Universitas Indonesia, Salemba Raya 6, Central Jakarta, 10430, Indonesia.

Tea is a popular beverage consumed worldwide and become an easy way to help lower blood triglyceride levels because it contains epigallocatechin-3-gallate (EGCG) which can inhibit fat absorption with minimal side effect.[16–20] Some studies showed that EGCG in tea can decreased the levels of serum cholesterol and triglyceride and more effective on lowering micellar solubility and interfere with the absorption on micelles in the gut.[21,22]The studies of catechins in green tea showed that it can against postprandial serum triglyceride levels, lower total cholesterol and LDL cholesterol, but do not have significant effects on HDL.[18,20–26] Catechin levels are generally equivalent to 30-40% of the dry weight of green tea with EGCG content of approximately 59% of the total catechin.[18,25]White tea is made from *Camellia sinensis*young shoots (lead buds that are covered with downy and white hair) without a fermentation process and protected from sunlight to avoid polyphenol degradation.[27,28] White tea contains polyphenols that did not experience oxidation and destruction in processing. This causes the amount of gallic acid, theobromine, epigallocatechin (EGC), caffeine, EGCG, and epicatechin-3-gallate (ECG) are higher and stronger polyphenol activity which is estimated to have more health effects than green tea.[25,29–31]Research by Anderson on white tea and green tea catechins showed that the highest levels were found in water temperature 95-100^{o}C with a brewing time of at least 10 minutes. Catechin levels seemed to slightly decreased by 3% within a maximum of 24 hours.[30,31]The result from research on the effect of catechins in tea to decrease serum triglyceride levels still have not been clearly. The study by Sohleet al.[32]showed that white tea extracts in human adipocytes stimulate lipolysis and inhibit adipogenesis at the same time. Other studies also showed that the levels of some types of white tea catechins are higher than other teas. Currently there is no research on the effect of white tea catechins and green tea against postprandial serum triglyceride levels after eating high fat diets. The subject of this study conducted on borderline

hypertriglyceridemia must be 20-64 years old based on the redistribution of fat is associated with the risk of coronary artery disease.[33,34]

METHODOLOGY

Subjects and study design

Subjects in this study are 23 people who met the study criteria (medical history, anthropometric examination, blood pressure, and fasting triglyceride levels examinations). The double-blind randomized allocation to the 23 subjects was then divided into two groups, which are the control group and the treatment group. The treatment group was given a high fat diet along with 7.5 grams of white tea in 200 ml water with temperature of 95-100^{o}C and brewing for 10 minutes were consumed within 30 minutes of brewing time.[30,31] The control group was given high fat diet along with 7.5 grams of green tea in 200 ml water with temperature of 95-100^{o}C and brewing for 10 minutes were consumed within 30 minutes of brewing time. Each subject got twice treatment with wash out period for at least 3 days.

Data collection

Characteristic data including age, gender, body mass index (BMI), and BMI classification. In order to determine the BMI of the subjects, body weight and height were measured using weight scale *Seca*with accuracy 0.1 kg and *microtoise stature meter,* respectively. The calorieandfatin takes of each subject was evaluated using food record 3 x 24 hours (two working day and Saturday/Sunday). Blood examination was performed to measure fasting serum triglyceride and 4-hours postprandial level. Enzymaticcolorimetrictest glycerol-3-phosphate-oxidase (GPO) was used for serum triglyceride test.

Statistical analysis

Data were analyzed using the program Statistical Package for Social Science (SPSS version 20). Analysis of energy and fat intake data is done using the Nutrisurvey program in 2007. The normality of data distributions was analyzed using the Shapiro-Wilk test. The difference in triglyceride levels and the difference change in triglyceride levels of pre-treatment and post-treatment groups compared to green tea and white tea were analyzed by paired t-test if data distribution is normal, if not it used the Wilcoxon test.

RESULTS AND DISCUSSION

Subject characteristics

In Table 1. showed the characteristics of research subjects. The mean age of the study subjects was 32.96 ± 8.04 years with 82.6% of the subjects were male. The mean BMI of the study subjects was 26.23 ± 3.62 kg/m^2 with 52.2% classified as obesity 1 and 21.7% classified as overweight.

Table 1. Characteristics of research subjects by age, sex, BMI, and BMI classification

Variable	n (%)	Mean ($\overline{X}$± SD)
Age (year)		32.96 ± 8.04
Gender (n)		
Male	19 (82.6)	
Female	4 (17.4)	
BMI (kg/m^2)		26.23 ± 3.62
BMI classification (n)		
- Underweight	0 (0)	
- Normal	4 (17.4)	
- Overweight	5 (21.7)	
- Obesity I	12 (52.2)	
- Obesity II	2 (8.7)	

The youngest and oldest subject in this study was 21 and 50 years. At that age range, generally a trend towards changes in body composition, which is caused by a positive energy balance. This condition is characterized by weight gain, increase in adipocyte tissue, decreased muscle mass, as well as the redistribution of fat to the intra-abdominal and central regions, thereby increasing the risk of dyslipidemia and cardiovascular diseases.[31,33] Therefore, in that age range is the right time to undertake health promotion to prevent a variety of chronic diseases, including cardiovascular diseases. NCEP recommend a blood lipid profile in healthy adults from the age of 20 years.[6]Most of the subjects (82,6%) in this study were male. The study by Wang et al.[34] showed that gender differences influence lipid metabolism and lipid profile levels in the plasma because of the effects of sex hormones. Levels of lipid profile, especially in premenopausal women showed a specific result with the tendency to value higher HDL and the value of LDL and TG-VLDL lower because the speed of clearance TG-VLDL higher and lower secretion of apo B-100. In contrast to men, the same study showed that most male subjects had borderline serum triglyceride levels. It concluded that women have a lipid profile proatherogeniclower than men. Male gender became one of the major risk factors for ischemic heart disease and hypertriglyceridemia because adult men have cardiovascular disease risk factors that appear earlier than women.[31]The mean BMI of subjects was 26.23 ± 3.62 kg/m^2 to 52.2% of the subjects classified as obesity 1 and 21.7% classified as overweight. this is appropriate with the data by Riskesdas in 2013 the prevalence of overweight and obesity in Indonesia are respectively 13.5% and 15.4%.[35]American Heart Association (AHA) in 2004 shows that there has been an increase in the prevalence of overweight and obesity in developing countries, starting at the young age.[3,14]International Burden of Disease Network (IBDN) shows data on the prevalence of overweight and obesity in adult individuals, each of 1 billion and 200 million worldwide. IBDN also mentioned that the prevalence of cardiovascular disease in the world reached 21%, particularly in individuals with a BMI above 21 kg/m^2.[3]A study by Wong and Levy shows there is a correlation factor improvement in the risk of cardiovascular disease at plasma lipid levels and in overweight subjects.[36]Another study also showed there is an increase in risk factors for cardiovascular disease and stroke, on the subject of overweight and obesity.[37] Obesity is a strong predictor of worsening lipid metabolism, there is a significant positive correlation between obese subjects with elevated levels of triglyceride.[15]Epidemiological studies show that overweight and obesity is one of the leading causes of death in global. WHO has predicted an increase of 11.1 million deaths caused by cardiovascular disease in patients with overweight and obesity in 2020.[3]

Energy and fat intake

Total energy intake and fat intake in this study obtained through methods of food records during 3 x 24 hours. Table 2. showed the mean total energy intake of the subjects in this study was 1653.16 ± 317.66 kcal/day, while the subject of fat intake amounted to 64.13 (43.50 to 148.97) g/day with a proportion of 34.67 (30.00 to 46.00)%.

Table 2. The mean total energy intake and fat

Variable	Mean ± SD	Median (min – max)
Totalenergy (kkal/day)	1653.16 ± 317.66	

Fat (g/day)	64.13 (43.50 – 148.97)
Fat (% total calories)	34.67 (30.00 – 46.00)

The percentage of fat intake is according to the data by Riskesdas in 2010 about the large average fat consumption in Jakarta, which has exceeded 30% of total food intake.[38] Fat intake in this study also demonstrates a value that is greater than the number of fat intake recommendations for Indonesia according to the general guidelines of balanced nutrition (PUGS), amounting to 25% of total daily energy. WHO in 2003 also suggest that fat consumption is not more than 30 percent of the recommended guideline range is 15-30% of the total energy daily. The recommendations are caused by the composition and amount of fat consumed will determine body composition and fat components in the blood that contribute to disorders of lipid profile.[13]

Serum triglyceride levels before and after treatment

Table 3.showed there is no difference in fasting triglyceride levels among groups of research subjects given white tea and green tea. Test results triglyceride levels 4 hours postprandial (4-hours PP) showed that in the group given white tea showed elevated levels of triglycerides were significantly lower (231.43 ± 76.49 mg/dL, *P*= .024) compared with the group given green tea (273.61 ± 117.90 mg/dL).

Table 3. Differences in fasting triglyceride levels and 4-hours post-prandial between the two groups

Time	TG level		*P*
	White tea (mg/dL)	Green tea (mg/dL)	
Fasting	144.91 ± 52.32	166.65 ± 53.81	.079
4-hours PP	231.43 ± 76.49	273.61 ± 117.90	.024

All subjects involved in this study had border line fasting triglyceride levels (150-199 mg/dL). Furthermore, each subject were given twice treatment, the provision highfat diet eaten with green tea or white tea, then given the lag time between the washout the treatment for at least 3 days, based on the time it takes catechins from green tea and white tea for excretion and returned to baseline levels within 24-72 hours.[39] Before being given treatment, each subject was required to fast for 12 hours. This is consistent with the recommendations of the NCEP stating that the levels in the blood lipid profile will be back down to baseline and stable after fasting for 8-12 hours. Fastingis also expected to reduce the variability of blood triglyceride levels caused by food.The resultsoftheexaminationofthefastingtriglyceride levels can be used to assess risk factors for cardiovasculardisease are morestable.[6,40] The result showed that there was no difference in mean fasting triglyceride levels in both groups. Triple-crossover RCT study by Unnoet al., on a high fat diet along with green tea also showed no differences between the mean results of a fasting triglyceride levels in all three groups were studied.[23] The subsequent examination was performed 4 hours after administration of a high-fat diet along with green tea or white tea. The time required by triglycerides to begin entering the plasma flow in the form of chylomicronsnasens is 1-2 hours after a meal, while the time it takes to reach the peak value of the triglyceridestillvary, whichisbetween 3-8 hours.[15]Another study conducted by Unnoet al.,[23] showed that tea catechins time required to reach the highest levels in plasma is between 1.3 to 2.7 hours. The catechin levels will be settled and only a maximum decrease of 3% in the 24 hours.[30] Postprandial triglyceride levels at 3 and 4 hours show better markers to indicate a positive relationship between increased atherogenic risk factors with cardiovascular disease prediction in the future compared to the levels of fasting triglycerides. It is the underlying timing checks on the postprandial triglyceride at four hours. The value of postprandial triglyceride level is individual and varies between subjects.Until now, research that aims to see the effects of white tea catechins inhibit the absorption of fat from high-fat foods has never been done. The results of this study indicate that elevated levels of triglycerides in the group drinking white tea (231.43 ± 76.49 mg/dL) were less significant (*P*=.024), compared with those who drank green tea (273.61 ± 117.90 mg/dL).This is presumably because the amount of content of EGCG, EGC, gallic acid, ECG, the bromine, and caffeine in white tea is higher than that found in green tea. As is known compared to other teas, white tea manufacturing process do the most natural, does not oxidize, and crushes.[25,29] The content of EGCG has been shown to inhibit fat absorption portion. Research by Ikeda et al.[21] show the mechanism of EGCG in reducing elevated triglyceride levels in serum by inhibiting pancreatic lipase and slowing the absorption of triglycerides into the lymphatics. Research by Ikeda et al.[20] also shows the mechanisms of catechins in increasing the diameter of the micelles and reducing the surface area so that the absorption of triglycerides can be inhibited. Another mechanism is thought to affect the inhibitory effect of section galloyl group and EGCG polymer structure that can bind pancreatic lipase thus hindering the effectiveness of these enzymes in digesting fatty foods and leading to absorption of micelles inhibited or decreased.

Table4. showed delta fasting triglyceride levels and 4-hours post-prandial group smaller white tea (77 (25–326)) mg/dL) than green tea group (90 (17–329)mg/dL), although is not significant.

Table 4. Delta fasting triglyceride levels and 4-hours post-prandial between groups

Variable	4-hours PP		*P*
	White tea (mg/dL)	Green tea (mg/dL)	
Delta TG level	77 (25 – 326)	90 (17 – 329)	.681

Further analysis of the delta changes in triglyceride levels, shows that the delta changes in levels of triglycerides in the group of white tea are smaller than the green tea group, although not significantly. It is thought to relate to the results of laboratory tests white tea EGCG levels in this study, which are slightly higher than green tea. EGCG examination results are consistent with studies of Santana-Rios et al.[29] which showed white tea EGCG is slightly higher than green tea. Factors suspected to affect the levels of EGCG are differences in the varieties of tea, the age when the leaves are picked, the weather, the treatment horticulture, climate, soil conditions where grown teas, geographical location, and processing methods. Levels of EGCG in white tea which is slightly higher than green tea cause the inhibitory effect of higher fat but not significantly different.

CONCLUSION

Consumption of white tea within 30 minutes of brewing time with the same dose, temperature and brewing time in subjects after a high-fat food intake resulted in lower post prandial triglyceride levels compared to green tea.

REFERENCES

1. Wong ND. Epidemiological studies of CHD and the evolution of preventive cardiology. Nat Rev Cardiol. 2014;11(5). doi:10.1038/nrcardio.2014.26.
2. PerhimpunanDokterSpesialisKardiologi Indonesia.Pedomantatalaksanadislipidemia. Edisi ke-1. In: Central Communication; 2013.Indonesia.

3. American Heart Association. International Cardiovascular Disease Statistics.; 2004.
4. Fuster V, Kelly BB. Promoting Cardiovascular Health in the Developing World: A Critical Challenge to Achieve Global Health.; 2010. doi:10.17226/12815
5. National Cholesterol Education Program Expet Panel. Detection, evaluation, and treatment of high blood cholesterol in adults. In:2006.
6. Brewer HB. NCEP ATP III uncovers the challenge of treating dyslipidemia in patients with diabetes and metabolic syndrome. In: Advanced Studies in Medicine. Vol 3. ; 2003.
7. Pollin TI, Quartuccio M. What We Know About Diet, Genes, and Dyslipidemia: Is There Potential for Translation? CurrNutr Rep. 2013;2(4). doi:10.1007/s13668-013-0065-z
8. Talayero BG, Sacks FM. The role of triglycerides in atherosclerosis. CurrCardiol Rep. 2011;13(6). doi:10.1007/s11886-011-0220-3
9. BadanPenelitiandanPengembanganKesehatanDepartemenKesehatanRepublik Indonesia.RisetKesehatanDasar2007.; 2008.Indonesia
10. Pejic RN, Lee DT. Hypertriglyceridemia. Journal of the American Board of Family Medicine. 2006;19(3). doi:10.3122/jabfm.19.3.310
11. Yamada N. Control of triglyceride. Asian Med J. 2001;44:42-47.
12. Scisney-Matlock M, Bosworth HB, Giger JN, et al. Strategies for implementing and sustaining therapeutic lifestyle changes as part of hypertension management in African Americans. Postgrad Med. 2009;121(3). doi:10.3810/pgm.2009.05.2015
13. Hardinsyah. ANALISIS KONSUMSI LEMAK, GULA DAN GARAM PENDUDUK INDONESIA. GIZI INDONESIA. 2014;34(2). doi:10.36457/gizindo.v34i2.105.Indonesia
14. Chapter 44. Prevention of Chronic Disease by Means of Diet and Lifestyle Changes. In: Disease Control Priorities in Developing Countries (2nd Edition). ; 2006. doi:10.1596/978-0-8213-6179-5/chpt-44
15. Nogaroto V, Rodrigues MRS, Vicari MR, et al. High postprandial triglycerides serum levels: Is obesity a good predictor? An Acad Bras Cienc. 2015;87(1). doi:10.1590/0001-3765201520130380
16. McKay DL, Blumberg JB. The Role of Tea in Human Health: An Update. J Am CollNutr. 2002;21(1). doi:10.1080/07315724.2002.10719187
17. Cabrera C, Artacho R, Giménez R. Beneficial Effects of Green Tea—A Review. J Am CollNutr. 2006;25(2). doi:10.1080/07315724.2006.10719518
18. Koo SI, Noh SK. Green tea as inhibitor of the intestinal absorption of lipids: potential mechanism for its lipid-lowering effect. Journal of Nutritional Biochemistry. 2007;18(3). doi:10.1016/j.jnutbio.2006.12.005
19. Namita P, Mukesh R, Vijay KJ. Camellia sinensis (green tea): A review. Global Journal of Pharmacology. 2012;6(2).
20. Ikeda I, Imasato Y, Sasaki E, et al. Tea catechins decrease micellar solubility and intestinal absorption of cholesterol in rats. Biochimica et BiophysicaActa (BBA)/Lipids and Lipid Metabolism. 1992;1127(2). doi:10.1016/0005-2760(92)90269-2
21. Ikeda I, Tsuda K, Suzuki Y, et al. Tea catechins with a galloyl moiety suppress postprandial hypertriacylglycerolemia by delaying lymphatic transport of dietary fat in rats. Journal of Nutrition. 2005;135(2). doi:10.1093/jn/135.2.155
22. Bose M, Lambert JD, Ju J, Reuhl KR, Shapses SA, Yang CS. The major green tea polyphenol, (-)-epigallocatechin-3-gallate, inhibits obesity, metabolic syndrome, and fatty liver disease in high-fat-fed mice. Journal of Nutrition. 2008;138(9). doi:10.1093/jn/138.9.1677
23. Unno T, Tago M, Suzuki Y, et al. Effect of tea catechins on postprandial plasma lipid responses in human subjects. British Journal of Nutrition. 2005;93(4). doi:10.1079/bjn20041379
24. Kim A, Chiu A, Barone MK, et al. Green tea catechins decrease total and low-density lipoprotein cholesterol: A systematic review and meta-analysis. J Am Diet Assoc. 2011;111(11). doi:10.1016/j.jada.2011.08.009
25. Sajilata MG, Bajaj PR, Singhal RS. Tea polyphenols as nutraceuticals. Compr Rev Food Sci Food Saf. 2008;7(3). doi:10.1111/j.1541-4337.2008.00043.x
26. Williamson G, Dionisi F, Renouf M. Flavanols from green tea and phenolic acids from coffee: Critical quantitative evaluation of the pharmacokinetic data in humans after consumption of single doses of beverages. MolNutr Food Res. 2011;55(6). doi:10.1002/mnfr.201000631
27. Espinosa C, López-Jiménez JÁ, Cabrera L, et al. Protective effect of white tea extract against acute oxidative injury caused by adriamycin in different tissues. Food Chem. 2012;134(4). doi:10.1016/j.foodchem.2012.03.083
28. AdityaRifqi M, Setyaningtyas SW, Rachmah Q. White tea drink (Camellia sinensis) improves endurance and body weight maintenance of rats. J Health Res. 2022;36(1). doi:10.1108/JHR-01-2020-0020.Indonesia
29. Santana-Rios G, Orner GA, Amantana A, Provost C, Wu SY, Dashwood RH. Potent antimutagenic activity of white tea in comparison with green tea in the Salmonella assay. Mutat Res Genet Toxicol Environ Mutagen. 2001;495(1-2). doi:10.1016/S1383-5718(01)00200-5
30. Se A. Polyphenol and Caffein Concentrations Found in Lipton White Tea with Bluberry and Pomegranate. Thesis master. The Graduate School University of Wisconsin-Stout; 2011.
31. Brown JE. Nutrition Through the Life Cycle, 4th Ed.; 2011.
32. Söhle J, Knott A, Holtzmann U, et al. White Tea extract induces lipolytic activity and inhibits adipogenesis in human subcutaneous (pre)-adipocytes. NutrMetab (Lond). 2009;6. doi:10.1186/1743-7075-6-20
33. Rivlin RS. Keeping the young-elderly healthy: Is it too late to improve our health through nutrition? In: American Journal of Clinical Nutrition. Vol 86. ; 2007. doi:10.1093/ajcn/86.5.1572s
34. Wang X, Magkos F, Mittendorfer B. Sex differences in lipid and lipoprotein metabolism: It's not just about sex hormones. Journal of Clinical Endocrinology and Metabolism. 2011;96(4). doi:10.1210/jc.2010-2061
35. BadanPenelitiandanPengembanganKesehatanDepartemenKesehatanRepublik Indonesia. RisetKesehatanDasar 2013.; 2013.Indonesia
36. Wong ND, Levy D. Legacy of the Framingham Heart Study: Rationale, design, initial findings, and implications. Glob Heart. 2013;8(1). doi:10.1016/j.gheart.2012.12.001
37. Hooper L, Abdelhamid A, Moore HJ, Douthwaite W, Skeaff CM, Summerbell CD. Effect of reducing total fat intake on body weight: Systematic review and meta-analysis of randomised controlled trials and cohort studies. BMJ (Online). 2013;345(7891). doi:10.1136/bmj.e7666
38. BadanPenelitiandanPengembanganKesehatanDepartemenKesehatanRepublik Indonesia. RisetKesehatanDasar 2010.; 2010.Indonesia
39. van het Hof KH, Wiseman SA, Yang CS, Tijburg LBM. Plasma and Lipoprotein Levels of Tea Catechins Following Repeated Tea Consumption. Exp Biol Med. 1999;220(4). doi:10.3181/00379727-220-44366
40. Bansal S, Buring JE, Rifai N, Mora S, Sacks FM, Ridker PM. Fasting compared with nonfasting triglycerides and risk of cardiovascular events in women. JAMA. 2007;298(3). doi:10.1001/jama.298.3.309

****