



Original Article

The Effect of High Fiber Diet on Lipid Profile of Obese Young Girls: a Randomized Crossover Clinical Trial

Zeinab Piraloo¹, Sedighe Forouhari², Seyede Zahra Ghaemi³, Zahra Mohammadi⁴, Parisa Rostambeigy⁵, Maryam Piraloo¹, Forugh Mahmudi⁶, Mostafa Mohammadi⁷

1. Student Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran
2. Infertility Research Center, Community Based Psychiatric Care Research Center, Shiraz University of Medical Sciences, Shiraz, Iran
3. Department of Midwifery, Estahban Branch, Islamic Azad University, Estahban, Iran
4. Shahid Beheshti University of Medical Sciences, Tehran, Iran
5. Department of Nursing, Estahban Branch, Islamic Azad University, Estahban, Iran
6. Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
7. Yasuj University of Medical Sciences, Yasuj, Iran

Please cite this paper as: Piraloo Z, Forouhari S, Ghaemi SZ, Mohammadi Z, Rostambeigy P, Piraloo M, et al. The Effect of High Fiber Diet on Lipid Profile of Obese Young Girls: a Randomized Crossover Clinical Trial. Int Elec J Med. 2014;3(1):19-24.

Corresponding author: Sedighe Forouhari, Infertility Research Center, Community Based Psychiatric Care Research Center, Shiraz University of Medical Sciences, Shiraz, Iran, E-mail: forouharism@yahoo.com.

Abstract:

Introduction: The aim of the present study was to evaluate the effect of high fiber diet on lipid profile of obese adolescent girls.

Methods: This randomized cross over clinical trial was conducted in southern Iran. A total of 56 patients were randomly assigned into two groups. In the first phase, the experiment group had a high fiber diet while the control group consumed their usual diet for 2 months. Then, both groups returned to their usual diet for a month (clean phase) and after that, the diet was replaced for 2 months again (third phase). Serum LDL, HDL, TG and cholesterol were assessed before the intervention, after first phase, clean phase and third phase.

Results: The mean reduction of cholesterol, TG, LDL and HDL were significantly lower in high fiber regimens compared to common diet.

Conclusion: The results showed that high fiber dietary can significantly reduce lipid profile of obese patients. Consumption of high fiber diet is recommended in order to reduce the adverse effects of obesity.

Keywords: Cholesterol, Triglycerides, Female, Obesity



Introduction:

Over the past two decades, childhood obesity has become a major public health concern (1). Evaluations of the prevalence of overweight and obesity among the 5-17 year old children have shown that almost 20% of the children around the world suffer from excess body weight. Nevertheless, this measure is close to 30% in some countries, such as Greece (2), the United States (3), and Italy (4), while it is 10% or less in some other countries, such as China (5), Korea (6), and Turkey (7). The prevalence of overweight in Iran among urban and rural areas among 15 to 39 years old population are estimated to be about 22% and 16%, respectively (8).

In addition to physical limitations, obesity can lead to psychological symptoms including depression, social avoidance and low self-esteem (1).

Several treatment strategies have been recommended for the management of obesity but, the available weight loss drugs are not approved for all age groups. Therefore, the best treatment seems to be early prevention or even employing safer methods (9). Various methods with maximum efficiency and minimal adverse effects such as proper diet and exercise can eliminate this problem. High-fiber diets are a well known and effective treatment which is recently more noticed. Diets enriched by carbohydrates and fiber, such as Beans, vegetables, fruits and whole grains prevent and even improve lipid abnormalities (10). The aim of the present study was to assess the influence of high fiber diet on blood lipids of obese adolescent girls.

Method:

This study was a randomized crossover clinical trial which was approved by ethic committee of Shiraz University of Medical Sciences. The target population comprised all adolescent girls who lived in Shiraz city from April 2012 to September 2012. Written informed consent was obtained from all subjects and the research project was registered in Iranian Clinical Trial Registry (IRCT ID: 2012120811699N1).

Totally 54 obese (BMI above 25) adolescent girls aged between 15 and 19 years old were selected and were equally, randomly divided into case and treatment groups (28 participants for each group). All subjects became aware of the study purpose.

Patients with previous medical disease/disorders, irregular menstruation, vegetarian diet and suspected pregnancy were excluded from the study. Also, those who consumed hormonal tablets, vitamin supplements, corticosteroids, anti diabetic agents and tetracycline were excluded. BMI of participants was calculated and demographic data of all subjects was collected.

This study was conducted in 3 phases. During the first phase, the patients in treatment group (group A) were asked to consume high fiber rich foods including leafy vegetables and fresh fruits for 2 months, and control subjects (group B) were asked to use their usual diet concomitantly. In the second phase, all



participants consumed their usual diets for a month (clean phase) and, in the third phase, the intervention was exchanged between the both groups.

Before starting study, in the end of the first, second and the third phases 10 ml of patients' blood was collected and serum levels of TG, HDL and cholesterol of all participants was measured.

Data was analyzed using statistical package for the social sciences (SPSS) version 19. Quantitative variables among two groups were compared using Independent T-test. Changes in serum levels of TG, LDL, HDL and cholesterol was analyzed by Paired ample T-test. Significant level considered below 0.05.

Results:

The mean (SD) age of participants was 16.97 (1.05) years. Basic characteristic of patients are demonstrated in the table below.

Table 1: Basic characteristics of participants

Variable	Group A (mean ± S.D)	Group B (mean ± S.D)	P-Value
Age	16.78 ± 1.05	17.17 ± 1.02	NS*
Cholesterol (mg/dl)	147.93 ± 27.33	142.1 ± 29.1	NS
HDL (mg/dl)	50.75 ± 13.1	51.96 ± 11.18	NS
LDL (mg/dl)	116.46 ± 34.62	121.07 ± 26.54	NS
Triglyceride (mg/dl)	109.93 ± 32.61	119.75 ± 34.95	NS

*NS: not significant

As demonstrated in table 1, there were no significant differences between case and control subjects before starting study. In table 2, serum levels of cholesterol, HDL, LDL and triglyceride before and during intervention are demonstrated.

Conclusion:

This clinical trial was conducted to assess the influence of high fiber diet on lipid profile in obese adolescent girls. Since 1960, many international studies have estimated the prevalence of obesity in children. Childhood obesity increased more than doubled in children and tripled in adolescents in the past 30 years (11, 12).

Table 2: lipid profiles of participants during study

Hormone	Group	Initial	After the first phase	After the clean phase	After the third phase	P-Value
Cholesterol (mg/dl)	A	147.93 ± 27.33	147.07 ± 27.13	217.21 ± 27.6	147.25 ± 26.02	< 0.01
	B	142.1 ± 29.1	142.86 ± 30.40	141.00 ± 29.9	126.61 ± 28.94	
HDL (mg/dl)	A	50.75 ± 13.1	46.89 ± 11.46	48.43 ± 12.07	49.00 ± 11.53	< 0.01
	B	51.96 ± 11.18	50.89 ± 11.13	52.43 ± 10.27	42.71 ± 8.12	
LDL (mg/dl)	A	116.46 ± 34.62	111.39 ± 34.20	112.07 ± 31.30	114.57 ± 33.90	< 0.01
	B	121.07 ± 26.54	118.04 ± 26.58	124.14 ± 26.29	107.04 ± 24.30	
Triglyceride (mg/dl)	A	109.93 ± 32.61	85.68 ± 18.61	107.32 ± 29.58	104.71 ± 28.52	< 0.01
	B	119.75 ± 34.95	123.57 ± 35.70	122.39 ± 35.28	97.11 ± 25.91	

The prevalence of American obese children with 6 to 11 years old increased from 7% in 1980 to nearly 18% in 2010. Similarly, the obese adolescents with 12–19 years old increased from 5% to 18% over the same period (11, 12). In 2010, more than one third of children and adolescents were overweight or obese (12). The prevalence of obesity and overweight in adolescents is not limited to western countries. Kelishadi et al. showed the prevalence of overweight in 21 111 school students aged 6–18 years, from urban (84.6%) and rural (15.4%) areas of 23 provinces in Iran was 8.82%, 11.3% and 10.1% according to the CDC, IOTF and national cut-offs, respectively (13).

According to the another study in Tehran, the capital city of Iran, the prevalence of overweight and obesity in 2321 adolescents with 11–16 years old, estimated 21.1 and 7.8%, respectively(14).

The main action in the diet with high-fiber amounts and foods containing starch are slowly digestion of them, resulting in increased insulin sensitivity and decreased absorption of lipids, thereby decreasing more triglycerides and cholesterol LDL and increase HDL concentration. So we can say the response to lipid and cholesterol changed after high-fiber food consumption (15). Fruits, green vegetables and legumes are important sources of dietary fiber and are low-glycemic-index foods. The consumption of these foods also has a role in weight management probably because their consumption decreases energy density, promotes satiety and decreases energy intake (16-18).

The results of our study demonstrated that high fiber diet can significantly decrease the lipid profile including LDL, HDL, TG and cholesterol. These findings are consistent with other studies (19-21). Several mechanisms have been introduced for the effect of high fiber diet on lipid profile including decreasing intestinal absorption of bile acid, change in hepatic synthesis of cholesterol and LDL and also, reducing endogenous synthesis of lipid profiles (22-24).



The limitation of the present study was that did not assess the BMI of patients as a separate variable and we could not compare the weights of patients before and after intervention.

This study demonstrated that high fiber diet significantly affect the lipid profile of obese adolescent girls. Accommodation of dietary fiber in daily diet program is recommended for obese patients in order to decrease the prevalence of obesity and even cardiovascular disease.

Acknowledgment: This study was resulted from student thesis in Shiraz University of Medical Sciences (SUMS). Thereby we thank research council of SUMS for financial support.

Conflict of interest: The authors have declared that they have no conflicts of interest.

References:

1. Jackson D, Mannix J, Faga P, McDonald G. Overweight and obese children: mothers' strategies. *Journal of advanced nursing*. 2005;52(1):6-13.
2. Mamalakis G, Kafatos A. Prevalence of obesity in Greece. *International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity*. 1996;20(5):488.
3. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA: the journal of the American Medical Association*. 2006;295(13):1549-55.
4. Pagano R, La Vecchia C. Overweight and obesity in Italy, 1990-91. *International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity*. 1994;18(10):665.
5. Luo J, Hu FB. Time trends of obesity in pre-school children in China from 1989 to 1997. *International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity*. 2002;26(4):553.
6. Oh K, Jang MJ, Lee NY, Moon JS, Lee CG, Yoo MH, et al. Prevalence and trends in obesity among Korean children and adolescents in 1997 and 2005. *Korean Journal of Pediatrics*. 2008;51(9):950-5.
7. Yumuk V. Prevalence of obesity in Turkey. *Obesity reviews*. 2005;6(1):9-10.
8. Rashidi A, Mohammadpour-Ahramjani B, Vafa M, Karandish M. Prevalence of obesity in Iran. *Obesity reviews*. 2005;6(3):191-2.
9. Fisberg M, Baur L, Chen W, Hoppin A, Koletzko B, Lau D, et al. Obesity in children and adolescents: Working Group report of the second World Congress of Pediatric Gastroenterology, Hepatology, and Nutrition. *Journal of pediatric gastroenterology and nutrition*. 2004;39:678-87.
10. De Natale C, Annuzzi G, Bozzetto L, Mazzarella R, Costabile G, Ciano O, et al. Effects of a plant-based high-carbohydrate/high-fiber diet versus high-monounsaturated fat/low-carbohydrate diet on postprandial lipids in type 2 diabetic patients. *Diabetes Care*. 2009;32(12):2168-73.
11. Zametkin AJ, Zoon CK, Klein HW, Munson S. Psychiatric aspects of child and adolescent obesity: a review of the past 10 years. *J Am Acad Child Adolesc Psychiatry* 2004; 43: 134-150.
12. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *JAMA: the journal of the American Medical Association*. 2012;307(5):483-90.



13. Kelishadi R, Ardalan G, Gheiratmand R, Majdzadeh R, Hosseini M, Gouya M, et al. Thinness, overweight and obesity in a national sample of Iranian children and adolescents: CASPIAN Study. *Child: care, health and development*. 2008;34(1):44-54.
14. Mohammadpour-Ahranjani B, Rashidi A, Karandish M, Eshraghian M, Kalantari N. Prevalence of overweight and obesity in adolescent Tehrani students, 2000–2001: an epidemic health problem. *Public health nutrition*. 2004;7(05):645-8.
15. Lundin E, Zhang J-X, Lairon D, Tidehag P, Åman P, Adlercreutz H, et al. Effects of meal frequency and high-fibre rye-bread diet on glucose and lipid metabolism and ileal excretion of energy and sterols in ileostomy subjects. *European journal of clinical nutrition*. 2004;58(10):1410-9.
16. Liu S, Willett WC, Manson JE, Hu FB, Rosner B, Colditz G. Relation between changes in intakes of dietary fiber and grain products and changes in weight and development of obesity among middle-aged women. *The American journal of clinical nutrition*. 2003;78(5):920-7.
17. Birketvedt G, Aaseth J, Florholmen J, Rytting K. Long-term effect of fibre supplement and reduced energy intake on body weight and blood lipids in overweight subjects. *Acta Medica (Hradec Kralove)*. 2000;43(4):129-32.
18. Howarth NC, Saltzman E, Roberts SB. Dietary fiber and weight regulation. *Nutrition reviews*. 2001;59(5):129-39.
19. Trautwein EA, Kunath-Rau A, Erbersdobler HF. Increased fecal bile acid excretion and changes in the circulating bile acid pool are involved in the hypocholesterolemic and gallstone-preventive actions of psyllium in hamsters. *The Journal of nutrition*. 1999;129(4):896-902.
20. Fernandez ML. Distinct mechanisms of plasma LDL lowering by dietary fiber in the guinea pig: specific effects of pectin, guar gum, and psyllium. *Journal of lipid research*. 1995;36(11):2394-404.
21. Ruixing Y, Jinzhen W, Yaoheng H, Jing T, Hai W, Muyan L, et al. Associations of diet and lifestyle with hyperlipidemia for middle-aged and elderly persons among the Guangxi Bai Ku Yao and Han populations. *Journal of the American Dietetic Association*. 2008;108(6):970-6.
22. Roy S, Freake HC, Fernández ML. Gender and hormonal status affect the regulation of hepatic cholesterol 7 α -hydroxylase activity and mRNA abundance by dietary soluble fiber in the guinea pig. *Atherosclerosis* 2002; 163: 29-37.
23. Fernandez M-L. Soluble fiber and nondigestible carbohydrate effects on plasma lipids and cardiovascular risk. *Current opinion in lipidology*. 2001;12(1):35-40.
24. Jones P, Leitch CA, Pederson RA. Meal-frequency effects on plasma hormone concentrations and cholesterol synthesis in humans. *The American journal of clinical nutrition*. 1993;57(6):868-74.