Original Article

The evaluation of the relationship between some related hormone levels and diet in obese or overweight patients with hirsutism: A randomized clinical trial

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Abstract

Introduction: Hirsutism is a common disorder that has remarkable physical and mental effects on individuals. No appropriate diet has yet specified for individuals with hirsutism. The present study was carried out to examine the effect of high-fibre, low-caloric balanced diet on some related hormone levels in obese or overweight women with hirsutism who had referred to clinics affiliated with Shiraz University of Medical Sciences. **Materials and Methods:** The present study was a clinical trial that was carried out on 47 obese or overweight women with hirsutism in 2014. The women were randomly assigned to an intervention group and a control group that, respectively, consumed a high-fiber, low-caloric balanced diet and a normal diet for 3 months. A demographic characteristics questionnaire and a researcher-designed diet questionnaire were filled out by the two groups before the intervention. Before and 12 weeks after the intervention, body mass index (BMI) was measured and blood samples (on the 3–5 days of menstruation) were collected. Factors of luteinizing hormone, follice stimulating hormone, sex hormone binding globulin, dehydroepiandrosterone sulfate, low-density lipoproteins, high-density lipoproteins (HDL), fasting blood sugar (FBS), CHOL, prolactin, triglycerides, insulin, 17-hydroxyprogesterone, and free androstenedione testosterone were measured. The collected data were analyzed through *t*-test, Chi-square, and intergroup analysis using SPSS 22.0. **Results:** The mean age of the participating women was 27.23 ± 5.42 years. After the study, the level of FBS and insulin in the intervention group dropped while they increased in the control group. Moreover, the postintervention level of BMI in the intervention group on average decreased 1.89 units while it rose by 0.3 units in the control group, and there was a significant difference between the two groups ($P < 0.001$). **Conclusion:** The results of the present study showed that consuming high-fiber diet by obese or overweight women with hirsutism and polycystic ovary can reduce some factors including the level of FBS, insulin, and cholesterol and enhance blood HDL. Therefore, consuming this type of diet is recommended to treat this disorder.

Keywords: High-fiber diet, hirsutism, obesity, overweight, sex hormones

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Introduction

Hirsutism is defined as an increase in terminal hair growth in women with a male pattern.[1] Different studies of hirsutism

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have indicated different prevalence depending on the population, age group, scoring scale, and classification of hirsutism severity. Reviews reported its prevalence 5%–10%. Moreover, hirsutism has a different prevalence among different races, with a high prevalence in eastern societies such as Iran.[2,3]

Hirsutism is the most common symptom of hyperandrogenism which in turn can increase the risk of cardiovascular diseases.[4]

The causes of hirsutism are specific endocrine disorders including androgen-secreting tumors, classic and nonclassic congenital adrenal hyperplasia, Cushing's syndrome, and hyperandrogenic insulin-resistant acanthosis nigricans syndrome, disorders that are diagnosed based on rejecting other causes including polycystic ovary syndrome (PCOS) and idiopathic hirsutism, and diseases such as hyperprolactinemia, hypothyroidism, and acromegaly, and taking certain medications such as methyltestosterone, phenytoin, diazoxide, danazol, cyclosporine, and so on.[5-7]

Cutaneous signs that are commonly associated with hirsutism include acne, acanthosis nigricans a type of skin disease with velvet-like lesions, which mostly appears in wrinkled areas of the body. and baldness with a male pattern. Patients may have symptoms of virilization including deepening of the voice as a result of hypertrophy of the vocal cords, an increase in muscle mass, amenorrhea, and clitoromegaly.[8]

Negative effects of hirsutism on the quality of life among women have been focused on in a large number of studies. This common phenomenon not only affects beauty but is also associated with a decrease in self-confidence and an increase in anxiety and depression. The age of onset is about 13–19 years.[9] Evaluation of women with hirsutism includes taking a history and physical examination of laboratory evaluations.[10,11]

Such individuals are cured locally and therapeutically. In addition, recent studies have proved the effect of diet on the treatment results.[12]

An appropriate diet is one of the methods that can be employed to improve hirsutism. The results of studies that focused on the effect of comprehensive diet (consumption of less animal fat, and increased intake of fiber, unsaturated fat, and phytoestrogens) sex hormones among women indicated that a comprehensive diet can lead to a reduction in insulin resistance, a significant increase in sex hormone binding globulin (SHBG), and a major reduction in testosterone concentration, body weight, total cholesterol, and fasting glucose and insulin.[13-15]

Some scholars believe that low-caloric diet and weight loss to a large extent lead to correction of hormonal disorders, menstruation regulation, and hirsutism improvement. The results of a study showed that there is a significant relationship between hirsutism and weight, menstrual disorders, and family history of hirsutism among university students. Other studies indicated the relationship between hirsutism and obesity due to the conversion of more hormones in adipose tissue.[16]

A high-fiber diet also has an effective relationship with health and decreases the risk of PCOS, cardiovascular diseases, diabetes, stroke, and breast and colon cancers.[17-19] A diet full of carbohydrates and fiber, such as grains, vegetables, fruits, and whole grains, may be useful for treating most metabolic and hormonal problems and abnormal changes of fat after eating.[20]

American Heart Association and United States Department of Agriculture suggest consuming 20–35 gr fiber.[21] An appropriate diet does not cause a remarkable cost on the individual and the health system, naturally involves useful impacts without side effects, and at the same time, prevents hirsutism-related androgen-induced disorders by reducing androgens. Therefore, the researchers decided to examine the effect of high-fiber low-caloric diet on hirsutism-related hormones.

Methods

The present study was a clinical randomized trial that was carried out on 60 women with hirsutism and an age range of 18–45 who had referred to the clinics affiliated with Shiraz University of Medical Sciences in 2014. They were randomly selected using a purposive convenience sampling method. Inclusion criteria were body mass index (BMI) ≥25, no use of certain diet or medicine, lack of thyroid, kidney, liver, and digestive diseases, lack of pregnancy and breast-feeding, and lack of consuming tobacco. Moreover, exclusion criteria included hypothyroidism, adrenal hyperplasia, kidney and liver problems, unwillingness to cooperate, the emergence of problems while using the high-fiber diet, and pregnancy. In the present study, 60 qualified people were interviewed with, and in the end of the study and after 1 year of sampling and intervention, there remained only 47 participants; 3 of them were crossed out from the study due to pregnancy and others because of changing the place of residence and lack of willingness to continue their cooperation with the study. The intervention group included 24 people, and the control group consisted of 23 people.

The executive protocol of the research project was explained to the participants. After the advantages and limitations of the proposed diet were explained to the intervention group and their informed consent was obtained, the demographic questionnaire was filled out in the two groups before the study, and the researcher-designed checklist of daily and weekly diet was completed for all of the participants for 3 days so that their basic diet could be specified. Individuals with unbalanced diets according to that questionnaire were crossed out from the study. The individuals' hirsutism score was measured using Freeman-Galway scale. To measure the hormones of luteinizing hormone (LH), follice stimulating hormone (FSH), SHBG, dehydroepiandrosterone sulfate, low-density lipoproteins, high-density lipoproteins (HDL), fasting blood sugar (FBS), CHOL, prolactin, triglycerides, insulin,

17-hydroxyprogesterone (17OHP), and free androstenedione testosterone before and after the study, the individuals referred to the same laboratory and 10 ml of their fasting blood was taken. Blood sampling in individuals with menstrual irregularities was carried out randomly and in those with regular menstruation was conducted on days 3–5 of menstruation. The proposed diet of the intervention group that included high-fiber foods and use of nuts with a vegetarian diet base and a list of other foods along with necessary recommendations was orally explained to the intervention group by a nutritionist. The control group; however, used their usual diet. All the participants were followed up for 12 weeks. Both groups' BMI was measured and recorded before and after the study. After the intervention, the target hormones were again measured in the two groups. Data analysis was carried out through *t*-test, Chi-square, Mann-Whitney U-test, (SPSS, Chicago, IL, USA) level was set at 5% for all tests.

Results

At the end of the study and after the intervention, 47 people (24 in the intervention group and 23 in the control group) remained; 3 people left the study due to pregnancy and the rest because of changing the place of residence. The mean age of the participating women was 27.23 ± 5.42 years. Out of the 47 women participating in the study, the highest frequency with regard to demographic characteristics was as follow: 85.1% (40 women) were housewives, 53.2% (25 women) had an academic education, and 55.3% (23 women) were married. The mean BMIs before the study were 31.03 ± 6.47 and 27.46 ± 2.97 in the intervention group and the control group, respectively. Regarding their demographic characteristics, the two groups were homogeneous before the study, and Chi-square test proved no significant difference between them. Moreover, the average age of menarche in the intervention group was 13.62 ± 1.34 years and in the control group 13.78 ± 1.34 years, and with this regard, the results of the *t*-test showed no difference between the two groups.

Independent *t*-test was employed to measure the mean level of changes in hormones in the two groups before and after the study, and Man-Whitney U-test was used whenever the data distribution was not normal [Table 1]. The changes observed in the level of insulin, cholesterol, BMI, FBS, free testosterone, and LH in the two groups were significant. After the experiment, the level of cholesterol, FBS, insulin, free testosterone, and LH in the intervention group dropped while their level increased in the control group. Moreover, poststudy BMI in the intervention group on average decreased 1.89 units, whereas the control group experienced 0.3 units of increase in their BMI, and in this regard, there was a significant difference between the two groups ($P < 0.001$) [Table 1].

T-test and Chi-square were used to examine the two groups regarding the mean score of hirsutism and menstrual pattern before and after the study; however, no significant difference was seen [Table 2].

Table 1: Comparing the observed average changes in the target factors before and after the intervention in the two groups

Factors	Mean±SD		Intergroup *P*
	Intervention group	Control group	
Insulin	−0.95±6.96	2.02±3.14	0.010
Prolactin	0.35±4.52	0.29±7.1	0.617
TG	−9.62±37.52	−12±45.59	0.624
Cholesterol	−14.6±22.1	0.91±25.34	0.039
FBS	−3.75±11.81	8.34±20.59	0.011
HDL	5.33±8.5	4.34±9.10	0.523
LDL	1.95±18.93	5.31±16.48	0.709
BMI	−1.89±1.19	0.30±1.14	<0.001
FSH	−0.44±1.48	−0.30±2.91	0.839
LH	−1.08±3	0.73±3.42	0.058
SHBG	5.47±12.93	−0.48±7.59	0.069
17OHP	0.10±0.77	0.34±1.1	0.394
DHEAS	−0.14±0.39	0.05±1.39	0.507
Free TES	−0.06±0.19	0.10±0.31	0.034

SD: Standard deviation; TG: Triglyceride; FBS: Fasting blood sugar; HDL: High-density lipoprotein; LDL: Low-density lipoprotein; BMI: Body mass index; FSH: Follicle stimulating hormone; LH: Luteinizing hormone; SHBG: Sex hormone binding globulin; 17OHP: 17-hydroxy progesterone; DHEAS: Dehydroepiandrosterone Sulfate; TES: Testosterone

Table 2: Comparing the mean score of hirsutism and menstrual pattern before and after the study in the two groups

Variable	Mean±SD		Intergroup *P*
	Intervention group	Control group	
Hirsutism score	9.33±2.66	9.13±2.22	0.779
Menstrual pattern			
Regular	7 (29.2)	7 (30.4)	0.924
Irregular	17 (70.8)	16 (69.6)	

SD: Standard deviation

Discussion

The present study was aimed at examining the effect of high-fiber low-caloric diet on some factors of hirsutism among obese or overweight women who had referred to the clinics affiliated with Shiraz University of Medical Sciences.

The average age of the participants was 27 years, and other variables were similar to those of the study carried out by others.[22-24] The occurrence of hirsutism at a young age can indicate that prevalence of this disorder at such ages can be due to the prevalence of disorders such as hyperandrogenism and PCOS which cause hirsutism.[12,25]

The results of the present study showed that using a high-fiber low-caloric diet could reduce the level of cholesterol, fasting blood sugar, and insulin and increase blood HDL. With regard to other factors, hirsutism scores, and menstrual cycle pattern; however, it did not have a remarkable effect.

In the study carried out by Turzani, aimed at comparing the effect of diet and exercise on obese women with PCOS, 50 women were randomly divided into an experimental group ($n = 25$) and a control

group (n = 25). In addition to receiving conventional treatment, the experimental group used a proposed diet (carbohydrates 40%, fat 30%, and protein 30%) and took part in a 24-session exercise program for 12 weeks. In the beginning of the study, all of the patients were examined regarding demographic characteristics (weight, height, menstruation status, oligomenorrhea, hirsutism, acne, inflammatory disease of the sebaceous follicle, BMI, and alopecia (progressive and chronic hair loss in the central region of the scalp with a female-pattern). Biochemical and hormonal examinations and abdominal ultrasound were carried out in the two groups before and after the study, and the results were compared. The results showed that the proposed exercise and diet led to change in the level of FSH, LH, triiodothyronine (T3), thyroxine (T4), thyroid stimulating hormone, total testosterone, free testosterone, estradiol, SHBG, 17OHP, triglyceride, and total cholesterol, and improved BMI, oligomenorrhea, hirsutism condition, acne, alopecia, and sonography findings[23] which are somewhat in agreement with the results of the present study.

In the present study, BMI and hirsutism had no significant decrease after the study, but the level of blood HDL, insulin, blood sugar, and cholesterol changed. The difference between the present study and the one carried out by Turzani can be attributed to the proposed exercise along with the diet, because aerobic exercise can have a quick effect on the level of cholesterol, blood triglyceride, and body weight and decrease BMI, whereby the individuals' hirsutism improves. Moreover, the study carried out by Mehrabani *et al.* consisted of 60 obese women with PCOS and hirsutism. They were randomly assigned into a one of the 2 low-caloric diets for 12 weeks. The groups were conventional hypo-caloric diet with 15% Pr. and modified hypo-caloric diet (MHCD) with 30% Pr. and foods with the low glycemic load. The two groups experienced a remarkable weight loss, and a remarkable decrease in insulin in the MHCD group was observed; however, other factors did not change.[26] These findings are in line with those of the present study. The results of the study conducted by Stamets *et al.* indicated that low-caloric diet, regardless of the content of the diet, caused a decrease in weight and the level of androgen among women with PCOS and hirsutism.[27]

Regarding their BMI, both groups were overweight and obese, but after the study, there was a significant decrease in the intervention group's weight. Obesity is known as a risk factor for PCOS and hirsutism.[12,28] In the study conducted by Ghaderi *et al.*, there was a direct relationship between BMI (weight gain), brunette skin color, dark hair color, and family history, and using a low-caloric diet was suggested for treating hirsutism[29] which are in agreement with the results of the present study. Moreover, the results of the study carried out by Renato showed that treatment with metformin along with low-caloric diet led to a decrease in weight and abdominal fat among women with PCOD. In addition, a remarkable decrease in insulin level, T, and leptin concentration was seen.[30]

One of the mechanisms of high-fiber diet is the effect that it has on hormones, such that it acts due to the effect of insulin and starting up a cycle among insulin, thalamus, pituitary, and ovary. Therefore, by stimulating the pituitary, insulin leads to an increase in and in some cases a decrease in gonadotropins.[31,32] The results of a study carried out by Shishehgar *et al.* in Tehran (2014), aimed at examining the diet of individuals with PCO and hirsutism and healthy individuals, showed that the individuals with PCO ate less fruit and vegetables and consumed more foods with a high glycemic load compared to the healthy individuals. Therefore, consuming more fruit and vegetables and foods with high levels of fiber can help such individuals.[22]

There was no difference between the two groups with regard to menstrual cycle pattern and hirsutism scores. In their prospective cohort study, Gaskins *et al.* examined 250 women with an age range of 18–44 over 2006–2009. They observed a decrease in the concentration of sex hormones including estradiol, progesterone, FSH, and LH after the women used a high-fiber diet during their menstrual cycle (P = 0.03).[33] The difference between this finding and that of the present study can be the difference between measurement instruments, the type of the diet in the intervention group, sample sizes, and study duration. One of the strengths of the present study, one can refer to the homogeneity of the participants' demographic characteristics which removed the confounding effect and use of high-fiber diet. And that some participants left the study due to the slow pace of weight loss was one of its limitations.

Conclusion

The results of the present study showed that high-fiber diet among obese or overweight women with hirsutism and PCO can reduce some factors including the level of FBS, insulin, and cholesterol, and raise blood HDL. Therefore, it is recommended that this diet should be used to treat this disorder.

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Conflicts of interest

There are no conflicts of interest.

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