International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 8; Issue 09 (E); September 2019; Page No.20030-20033
DOI: http://dx.doi.org/10.24327/ijcar.2019.3900.20033

Research Article

EVALUATION OF THE RELATIONSHIP BETWEEN DAILY FOOD CONSUMPTION RECORD AND ANTHROPOMETRIC MEASUREMENTS IN WOMEN WITH METABOLIC SYNDROME AND HYPOTHYROIDISM

Nazal Bardak Perçinci

Health Sciences Faculty European University of Lefke

A R T I C L E I N F O

Article History:

Received 12th June, 2019
Received in revised form 23rd July, 2019
Accepted 7th August, 2019
Published online 28th September, 2019

Key words:

Nutrition, hypothyroidism,metabolic syndrome

A B S T R A C T

Hypothyroidism occurs when the production and secretion of thyroxine (T4) and triiodothyronine (T3) hormones decreases and cause blood TSH level to increase. This study was conducted to determine the correlatation between daily food consumption and anthropometric measurement. The study was carried on 76 hypothyroidic female that are diagnosed to have metabolic syndrome. To these selected patients to determine the personal and disease information a questionnarie form is applied. The anthropometric values were taken and the frequency of food consumption was determined by 3-day food consumption record and food consumption form by indicating the portions.The avarage body weight of the patients was 85.21±7.82 kg, body fat mass was 32.70±8.45 kg, body fat percentage was 39.23±6.43 %, muscle mass was 41.64±6.54 kg, body muscle mass percentage was 51.92±5.48 %, waist circumference 90.61±7.86 cm, hip circumference 108.9±9.16 cm, waist/hip ratio was 0.832±5.82 and BMI was 31.12±4.13 kg/m2 .When BMI grouping is done and nutrient intake according to the groups is evaluated in terms of statistical difference; the difference between energy, protein, protein percentage, carbohydrate, carbohydrate percentage, fat, fat percentage, cholesterol and fiber values were significant ($p<0.05$).

INTRODUCTION

Thyroid hormones are in an inactive mode in thyroid glands in the form of thyroxine (T4). It is released by Thyroid Stimulating Hormone (TSH). Thyroid hormones work with negative feedback control mechanis in the hypothalamus. T4 reaches the peripheral tissues currently in biologically active form as triiodothyronine (T3) (1). Thyroid hormones has an important role on basal metabolism and lipid metabolism. An important function of thyroid hormones is the regulation of metabolism and thermogenesis. Abnormalities in thyroid function potentially affect body composition (2).

Observational epidemiological studies had shown a positive correlation between thyroid volume, body weight, body mass index (BMI), body area and lean tissue mass. Impaired thyroid functions outcome with the increased body weight. Increased serum TSH levels (hypothyroidism) was found to be effective in increasing human obesity. Many cross-sectional studies have shown that increased TSH levels are associated with increased BMI. This information is used for body weight control and monitoring (3,4).

Hypothyroidism is a clinical condition that thyroid hormone deficiency as a result of a slowdown in metabolismis. In many patients, hypothyroidism is permanent and needs lifelong treatment. The aim of treatment is to provide euthyroidic condition. Adult hypothyroidism is is a common type of hypothyroidism that is characterized by clinical symptoms and blood findings (5).

Recently studies show a possible relationship between functional abnormalities of metabolic syndrome (MS) and thyroid. Many studies carried out show a significant positive relationship between TSH and MS. Often studies results show that patients with MS significantly have increased thyroid volume and nodule prevalence. Metabolic Syndrome can be defined as a multiple cardiovascular risk factors together with insulin resistance (IR). It has been suggested to provide pathological link between the factors. Thyroid hormones alsohave a role on energy homeostasis, lipid and glucose metabolism and blood pressure. The hypothesis that MS and its components may be related with thyroid function disorders and can be solved by regulating the metabolism (7,8).

Based on this information, this study aimed to show the correlatation between daily food consumption and anthropometric measurement's of the hypothyroidic patients that have metabolic syndrome.

Corresponding author:* **Nazal Bardak Perçinci
Health Sciences Faculty European University of Lefke

MATERIALS AND METHOD

In this study, patient data was derived from the clinical information system for 101 patients who applied to Nazal Nutrition Center (Nicosia, Cyprus) from August to November 2014 who are hypothyroidic whose age are between 20-64 ages and not using any medicine for hypothyroidism. Baskent University Clinic Research Ethics Committee dated 07/01/2015 and 15/08 numbered Ethics Committee Approval is taken. Patients 'Informed Consent Form 'was read and asked if they would like to participate in the study. Patients willing to participate voluntarily were included in the study.

A questionnaire was applied to determine the personal characteristics of the patients. Demographic characteristics (age, gender, educational background, mariatal status), information on disease states (except thyroid diseases), general nutritional habits and menopausal conditions were questioned. Questionnaire forms are filled by interviewing face to face.

Following anthropometric measurements: body weight, body composition, waist and hip measurements were taken. The BMI value obtained by division of weight to height square value was used and the assessment was criteria as shown in the Table 1 below (9).

Table 1 Classification of Body Mass Index (9)

Classification	BMI (kg/m²)	
	Basic Intersection points	Improved Intersection points
Weak (low weight)	<18.50	<18.50
Excessive weakness	<16.00	<16.00
Moderate weakness	16.00-16.99	16.00-16.99
Slight weakness	17.00-18.49	17.00-18.49
Normal	18.50-24.99	18.50-22.99 23.00-24.99
Bulk, light weight, overweight	≥25.00	≥25.00
Before fatness (Pre-obese)	25.00-29.99	25.0-27.49 27.50-29.99
Obese	≥30.00	≥30.00
Fatness First Degree	30.00-34.99	30-32.49 32.50-34.99
Fatness Second Degree	35.00-39.99	35.0-37.49 37.50-39.99
Fatness Third Degree	≥40.00	≥40.00

The waist circumference was measured with tape measure by determining the midpoint of the region between the lower rib and the iliac crest, with arms on both sides and feet joined. While 80 centimeters and below are considered normal for women, 80-87 centimeters are considered as increased risk and 88 centimeters as high risk (10).

The hip circumference was taken upright when the patient was standing and calculated from the outermost point of the hip. For the most accurate measurement, two measurements were taken and the mean value was calculated. Waist/Hip ratio is calculated from the section of the waist circumference with the hip circumference and above 0.8 indicates that there is a risk (9).

In body component assessment, acceptable levels for women are 25% for total body fat, 38% for muscle, 12% for bone and 25% for muscle (11).

Body Mass Rate (BMR) calculation equation prepared by United Nations Food and Agriculture Organization (FAO), World Health Organization (WHO) and United Nations University (UNU) Experts Committee was used to calculate BMR of patients. According to this equation, the individuals' BMR's were calculated with Harris-Benedict formula as follows:

BMR: 14.818x weight (kg) for the ages of 18-30 +486.6
BMR: 8.126x weight (kg) +845.6 for the age of 30-60

Daily total energy requirement (TEG) was calculated with the determined activity factor (11).

Energy and nutrients taken from daily diet; Computer Aided Nutrition Program developed for Turkey, Nutrition Package Information Systems Program (BEBIS) is used to calculate daily food consumption amounts of patients.

Mean values were calculated for three-day food consumption records. The calculated energy and nutrient data were evaluated according to the recommended Dietary Reference Intake (DRI) according to age and gender (12).

In this study, the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) diagnostic criteria was used to detect and evaluate the presence of metabolic syndrome. These are the criterias;

1. Abdominal Obesity; waist circumference; women> 88 cm
2. Hypertriglyceridemia; triglyceride level ≥150 mg / dL
3. Low HDL-Cholesterol; HDL-Cholesterol: <50mg / dL in women
4. Hyperglycemia; fasting blood glucose ≥110mg / dL
5. Hypertension; blood pressure ≥135 / 85 mm / Hg
6. Metabolic syndrome is required to meet at least three of the factors (24).

The data were entered into the data file using SPSS 15 program. Demographic data, biochemical findings and anthropometric measurements of the subjects were performed by SPSS descriptive statistical analysis and shown in the relevant tables. In addition, t-test was used to determine whether the subjects differ significantly in terms of pre-test and post-test measurements. Prior to the analyzes, the appropriateness of the data to the assumptions of the parametric tests was investigated and it was concluded that the assumptions were met (13). Kruskal Wallis test was used to determine whether there were any differences between the periods in terms of numerical variables. Significance level was accepted as $p < 0.05$. In case of differences, the significance level was determined by Bonferroni correction.

RESULTS

Table 2 shows the anthropometric measurement distribution of patients. According to this the avarage body weight of the patients was85.21±7.82 kg, body fat mass was32.70±8.45 kg, body fat percentage was 39.23±6.43%, muscle mass was41.64±6.54 kg, body muscle mass percentage was 51.92±5.48 %, waist circumference 90.61±7.86 cm, hip circumference 108.9±9.16 cm, waist/hip ratio was 0.832±5.82 and BMI was 31.12±4.13kg/m^2.

Table 2 Anthropometric Measurement Distribution of Patients

Anthropometric Measurements	MS (+) (n=76)
Body Weight (kg)	85.21±7.82
Body Fat Mass(kg)	32.70±8.45
Body Fat Percentage (%)	39.23±6.43
Body Muscle Mass (kg)	41.64±6.54
Body Muscle Mass (%)	51.92±5.48
Waist circumference (cm)	90.61±7.86
Hip circumference (cm)	108.9±9.16
Waist/Hip Ratio	0.832±5.82
BMI (kg/m^2)	31.12±4.13

Table 3 shows the distribution of daily energy and macronutrient consumption of patients. The daily energy consumption was 1832.59±235.4 kkal, the protein intake was 58.34±12.26 gr and 12.73±4.62 % of the energy comes from protein, the carbohydrate intake was 243.00±28.1gr and 43.92±3.58 % of the energy comes from carbohydrate, the fat intake was 85.36±3.86 gr and 41.90±1.16 % of the energy comes from fat. When the fat consumption is divided and calculated in terms of saturated and unsaturated fatty acids; 14.94±3.46 % from saturated fats, 10.12±1.42 % from polyunsaturated fatty acids and 13.92±2.58 % from monounsaturated fatty acids. The daily cholesterol and fiber intake was 174.32±30.76 mg and 9.95±2.16 gr respectively.

Table 3 Distrubition of Daily Energy and Macronutrient Consumption of Patients

Energy and Nutrients Energy(kcal)	1832.59±235.4	1796.32±198.2
Protein (g)	58.34±12.26	58.01±12.54
Protein (%)	2.73±4.62	12.99±4.25
Carbohydrate (g)	243.00±28.1	224.88±29.5
Carbohydrate (%)	43.92±3.58	50.01±3.80
Fat (g)	85.36±3.86	83.02±4.15
Fat(%)	41.90±1.16	41.60±1.79
Saturated Fatty Acids (%)	14.94±3.46	11.83±3.42
Polyunsaturated Fatty Acids (%)	10.12±1.42	7.82±1.34
Monounsaturated Fatty Acids (%)	13.92±2.58	11.82±2.80
Cholesterol (mg)	174.32±30.76	163.9±31.25
Fiber (g)	9.95±2.16	13.91±2.79

Table 4 shows the classification of patients according to their BMI and a comparison of their nutrient consumption. When BMI grouping is done and nutrient intake according to the groups is evaluated in terms of statistical difference; the difference between energy, protein, protein percentage, carbohydrate, carbohydrate percentage, fat, fat percentage, cholesterol and fiber values were significant ($p<0.05$).

Table 4 The classification of patients according to their BMI and a comparison of their nutrient consumption

	Anthropometric Measurements		
	BMI above 25 kg/m^2	BMI below 25 kg/m^2	p value
Energy(kkal)	1785.3±123.4	1639.9±189.3	0.002*
Protein(g)	51.7±15.7	50.4±14.3	0.036*
Protein(%)	12.8±2.65	11.8±.2.85	0.044*
Carbohydrates (g)	205.8±25.8	206.1±22.7	0.216
Carbohydrates (%)	36.8±5.22	40.1±2.46	0.009*
Fat (g)	78.8±2.52	74.99±2.2	0.021*
Fat (%)	38.9±1.85[d]	34.9±1.89	0.016*
Saturated Fatty Acids(%)	12.8±1.74	12.5±1.29	0.564
Polyunsaturated Fatty Acids(%)	10.8±2.85	11.1±2.77	0.785
Monounsaturated Fatty Acids(%)	12.8±1.48	12.6±1.86	0.838
Cholesterol (mg)	184.52±42.8	161.52±42.6	0.021*
Fiber (g)	14.88±1.34	13.85±1.63	0.003*

Table 5 shows the comparison of energy and nutrient intakes consumption acoording to DRI values. The consumption amounts are classified as a pecentage values in 3 classes. According to the values adequate intake of iron was 20.5%, inadequate intake was 76.2% and excess intake was determined as 3.3%.Adequate intake of potassium is 36.6% and inadequate intake is 63.4%.Adequate intake of iodine is 14.8%, inadequate intake is 84.2% and excess intake is 1%.Adequate intake of calcium is 38.6% and inadequate intake is 61.4%.While adequate intake of sodium was 19.8%, insufficient intake was 71.3% and 0.9 % of excess intake. Adequate intake of niacin is 36.6% and inadequate intake is 63.4%.Adequate intake of riboflavin was 41.6% and inadequate intake was 58.4%.Adequate intake of folate was 23.8% and inadequate intake was 76.2%.Adequate intake of vitamin B6 is 32.7% and inadequate intake is 67.3%.Adequate intake of vitamin B12 is 14.8% and inadequate intake is 85.1%.Adequate intake of vitamin C is 36.6% and inadequate intake is 60.1%, while excess vitamin C intake is 3.3%.Adequate intake of vitamin A is 25.7% and inadequate intake is 74.3%.Adequate intake of vitamin E is 42.6% and inadequate intake is 57.4%.

Table 5 Evaluation of Vitamin and Mineral Intakes in Patients According to DRI Recommendations

Iron,mg	Sufficient (≤67) 20.5	Not Sufficient (%67-133) 76.2	Above the limits (≥133) 3.3
Potassium,mg	36.6	63.4	-
İode, mcg	14.8	84.2	1
Calcium,mg	38.6	61.4	-
Sodium,mg	19.8	79.3	0.9
Niasin,mg	36.6	63.4	-
Riboflavin,mg	41.6	58.4	-
Folat,µg	23.8	76.2	-
Vit B6,mg	32.7	67.3	-
Vit B12,µg	14.8	84.2	-
Vit C,mg	36.6	60.1	3.3
Vit A, mcgRE	25.7	74.3	-
Vit E,mg	42.6	57.4	-

DISCUSSION

The rapid proliferation, especially among women in recent years, shows that metabolic syndrome and related heart diseases are no longer a male disease. Women experience many changes in terms of metabolic syndrome during their life cycles, nutritional disorders, inactivity and other burdens of modern life are combined with these processes (15). In the light of this information, it was decided that the study should be conducted only on women.

There are many studies showing the effect of thyroid hormones on the obesity and metabolic outcomes of obesity. There is increasing evidence that thyroid functions change in obese patients. This has been associated with a chronic low-grade inflammatory response. In addition, although TSH values are within normal limits in many previous studies, there is a direct correlation between serum TSH and body mass indexes in obese patients, which may be related to the effect of thyroid hormones on many metabolic pathway regulation and energy consumption. Again, it is thought that leptin hormone may play an important role in the relationship between obesity and TSH values (12,14).

Metabolic Syndrome is an important cause of morbidity affecting more and more people around the world. In addition to environmental factors such as the adoption of a still lifestyle and a change in nutritional habits, some inherited characteristics also play a role. The International Diabetes Association (IDF) definition refers to abdominal obesity as the best predictor of Metabolic syndrome (MS). Abdominal obesity is the main component. The IDF partner group recommended abdominal obesity to be measured by waist circumference because it is applicable to all ethnic groups (20). Body mass index (BMI) is a widely used method for calculating the prevalence of obesity. Although BMI is a practical method, it cannot give the body fat mass and fat distribution clearly because fat distribution cannot be evaluated according to body parts. Waist / hip ratio is the first anthropometric method developed from epidemiological studies as an indicator of body fat distribution. An increase in abdominal fat tissue and thus an increase in waist / hip ratio adversely affects health. For example, the risk for diabetes increased 3.7 times in obese women, while it increased 10.3 times in abdominal obese women (16). In this study, the frequency of abdominal obesity was high.

The prevalence of obesity, which is defined as excessive fat accumulation in the body as a result of the energy intake being more than the energy consumed, shows a continuous increase. The combination of factors such as obesity, impaired glucose metabolism, dyslipidemia and hypertension constitutes the concept of metabolic syndrome '(21).

Obesity is a disease caused by the accumulation of excess fat in the body when the amount of energy taken from food exceeds the amount of energy consumed by basal metabolism and physical movement. Etiology, genetic causes, resting metabolism rate, energy intake, the amount of fat cells, eating habits and physical activity have a role (22).Dietary fiber has beneficial effects on weight loss, insulin resistance, total cholesterol level and correction of blood pressure (23. In this study, it was paid attention to increase the consumption of fiber when appropriate dietary treatment was applied to the patients. The daily fiber consumption of the patients was 12.93 ± 2.34 grams. It is also possible that patients' changing biochemical lipid profiles and decreased insulin resistance may be attributed to increased fiber consumption.

References

1. Coceanni M. Heart diseases in patients with thyroid dysfunction. Hyperthyroidism, hyperthyroidism and beyond. Anadolu Kardiyoloji Dergisi 13: 62- 6, 2013.
2. Güler Ş. Kronik obstrüktif akciğer hastalığı ile ürik asit düzeyleri arasında ilişki. Uzmanlık tezi, Süreyyapaşa Göğüs Hastalıkları ve Göğüs Cerrahisi Eğitim ve Araştırma Hastanesi, İstanbul, 2008.
3. Gowri M, Radhika H., Harshini V *et al*. Role of thyroid function tests in women with abnormal uterine bleeding. *Intertnational Journal of Reproduction, Contraception, Obstetrics and Gynecology* 3(1): 54-57, 2014.
4. Rotandi M, Magri F, Chiovato L. Thyroid and obesity: not a one-way interaction. *The Journal of Clinic Endocrinal Metabolism* 96(2), 2011.
5. Turgay CÖ. Hipotiroidizm tedavisi. Türkiye Klinikleri Journal of Endocrine 7(3): 37-40, 2014.
6. Dökmetaş HS, Erselcan T, Yüksel İ ve ark. Hipertiroidizimli hastalarında radyoaktif iyot tedavisinin sonuçları. Ulusal Cerrahi Dergisi 24(4): 189-92, 2001.
7. Aytürk S. Ötiroid bireylerde metabolik sendrom komponentleri ile tiroid fonksiyon, volüm ve nodül ilişkisi. Uzmanlık tezi, Başkent Üniversitesi Tıp Fakültesi, Ankara, 2009.
8. Efe B. Tiroid cerrahisinde tiroid hormonlarının preoperatif değişimleri. Uzmanlık tezi, Bakırköy Dr. Sadi Konuk Eğitim ve Araştırma Hastahanesi, İstanbul, 2006.
9. Oh JY, Song Y, Sung Y *et al*. Prevelance and factor analysis of metabolic syndrome in an Urban Korean population. American Dietetic Association Diabetes, 27(8): 2027-2032, 2004.
10. Han TS, Van Leer EM, Seidell L *et al*. Waist circumference action levels in the identification of cardiovascular risk factors: Prevalence study in a random sampale. British MedicalJournal311: 1401-1405,1995.
11. Baysal A. Beslenme. Hatipoğlu Yayın Evi Ankara, 2004.
12. Food and Nutrıtıon Board. dietary reference intakes for calcium, phosphorous, magnesium, vitamin d, and fluoride. Institute of Medicine 38-314, 1997.
13. Hayran O. Sağlık Bilimlerinde Araştırma ve İstatistik Yöntemler. Nobel Tıp Kitapevleri, 2012.
14. Kitahara CM, Platz E, Ladenson P *et al*. Body fatness and markers of thyroid function among U.S. men and women. Plus One 7(4), 2012.
15. Gönenç I, Vurazl Z. Metabolik sendrom ve kadın. Türkiye Klinikleri J Fam Med-Special Toics 4(6):65-9, 2013
16. Dessein PH, Joffe B, Stanwix A. Subclinical hypothyroidism is associated with insülin resistance in rheumatoid arthiritis. Clinical Thyroidology 14(6), 2004.
17. Oh JY, Song Y, Sung Y *et al*. Prevelance and factor analysis of metabolic syndrome in an Urban Korean population. American Dietetic Association Diabetes, 27(8): 2027-2032, 2004.
18. Surks M, Chopra JI , Mariash C *et al*. American thyroid association guidlines for use of laboratory tests in thyroid disorders. The Journal of the American Medical Association 263(11), 1529-1532, 1990.
19. Al-Hinai HQ, Jousilahti P. Prevalence of the Metabolic Syndrome Among Omani Adults.
20. Demir D, Bucaktepe GE , Kara İ. Metabolik sendrom, tip 2 diyabetes mellitus ve sağlıklı bireylerin sosyodemografik, antropometrik ve biyokimyasal özelliklerinin karşılaştırılması. Konuralp Tıp Dergisi 2(1): 12-19, 2010.
21. American Diabetes Association Diabetes Care 26(6): 1781-85, 2003.
22. Demir D, Bucaktepe GE, Kara İ. Metabolik sendrom, tip 2 diyabetes mellitus ve sağlıklı bireylerin sosyodemografik, antropometrik ve biyokimyasal özelliklerinin karşılaştırılması. Konuralp Tıp Dergisi 2(1): 12-19, 2010.
23. Köksal G, Noğay N. Çocuklarda metabolik sendrom tedavisinde beslenme yönetimi. Güncel Pediatri Dergisi, 10: 92-7,2012.
24. Grunday SM, Brewer HB, Cleeman JI *et al*. Definition of metabolic syndrome: report of the National Heart, Lung, and Blood Institute/American Heart Association Conference on scientific issues related to definition. Circulation 109: 433-438, 2004.

******