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The Relationship between Macronutrient Intake and Women's Abdominal Obesity in Sabzevar, Iran

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ABSTRACT

Background: Given that abdominal obesity increases the risk of affecting metabolic and cardiovascular diseases, this study was conducted to determine the relationship between energy and macronutrient intake with women's abdominal obesity in Sabzevar. **Methods:** In this study, 225 female nurses and medical staff in Vase'e hospital of Sabzevar were selected. In order to assess the dietary intake, data were gathered by completing food frequency questionnaire (FFQ). Anthropometric indices including: height, weight, waist circumference, hip circumference of the samples was measured according to standard guideline and waist to hip circumference ratio (WHR) and body mass index (BMI) were calculated. The WHR > 0.8 was considered as abdominal obesity. The level of significance was ($P < 0.05$). **Results:** The result showed that of the waist mean circumference was 80.73 ± 12.58 cm, hip circumference was 102.29 ± 11.57 cm and women's WHR was 0.87 ± 0.15. The mean of energy, fat, protein, carbohydrate and cholesterol intake in assessed women was more than the standard dietary intake. There was no significant relationship between abdominal obesity and energy and macronutrient intake. **Conclusions:** This study showed that the incidence of female abdominal obesity is high and energy and macronutrient intake is recommended more than the standard. This problem emphasizes the necessity of converting dietary habits and pattern of worker women in order to enhance dietary status and reducing obesity.

Keywords: *Abdominal obesity; Energy; Macronutrients; Women*

Introduction

Nowadays obesity has become a growing global public health problem, due to its high prevalence and substantial morbidity and mortality (Hu *et al.*, 2017).Worldwide obesity has nearly tripled since 1975. In 2016, more than 1.9 billion adults, 18 years and older, were overweight, out of which over 650 million were obese. In 2016, 39% of adults aged 18 years or older were overweight,

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and 13% were obese. According to the latest WHO data on the status of overweight and obesity in Iran in 2008, more than 50% of the population over the age of 20 in Iran has the body mass index (BMI) ≥ 25 kg/m^2, and 21.6% of Iranians over 20 year old are obese (BMI ≥ 30 kg/m^2) (Khabazkhoob *et al.*, 2017).

The prevalence of overweight among Iranian women is more than American women and the prevalence of obesity is nearly equal between Iranian and American women (Bahrami *et al.*, 2006). Genetically, physiological, psychological, cultural and social variables are effective in extending the obesity (Orzano and Scott, 2004). Obesity is accumulation of excess fat in the body. In obese persons, in addition to the rate of body fat mass, the distribution and location of this accumulation are important factors of being affected to diseases induced by obesity (World Health Organization, 2000). Fat accumulation in the body is in two patterns: central obesity or abdominal or android obesity which is known as a more important factor in being affected to diseases, and the other is fat distribution more identically and peripherally or gynoid obesity which is the accumulation of fat in buttocks and thighs and has a lower risk (Molarius and Seidell, 1998).

Conducted studies in Iran suggested the increase of obesity and abdominal obesity incidence (Azadbakht *et al.*, 2005, Azizi *et al.*, 2005, Veghari *et al.*, 2010). In an assessment in urban regions of Rafsanjan, the prevalence of abdominal obesity was reported 16.6% in men, 56.9% in women (Rezaeian and Salem, 2007). In a study in Tehran about glucose and lipid, the mean of WHR in men increased significantly from 0.92 in 1378 to 0.95 in 2002, and the mean of WHR in women increased significantly from 0.84 in 1999 to 0.88 in 2002 (Azadbakht *et al.*, 2005)

Previous studies have shown that abdominal obesity is a risk factor for affecting to metabolic, cardiovascular diseases, diabetes, hyperlipidemia, hypertension and renal diseases (Ito *et al.*, 2004, Oh *et al.*, 2013, Patel and Abate, 2013, Ryo *et al.*, 2005).

Unhealthy diet and low physical activity are factors causing obesity and abdominal obesity (World Health Organization, 2000). Bes-Rastrollo found that high energy density is effective in causing obesity and consuming high energy density causes the obesity in isocaloric pattern (Bes-Rastrollo *et al.*, 2008). A prospective study declared that women who consume diet with high energy density get overweight nearly 3 folds of women who have lower consumption (Savage *et al.*, 2008). In another study, consuming fat and fatty stew had a direct relationship with abdominal obesity in adolescent girls of Tehran (Abtahi *et al.*, 2013).

In adults aged 18 years and older, 39% of men and 40% of women were overweight and 11% of men and 15% of women were obese in 2016 (World Health Organization, 2011). Increasing the incidence of overweight and obesity in women versus men, makes women vulnerable against diseases due to overweight. On other hand, it seems that nurses and medical staff think less about their health and nutrition, because of busy working, less free time, working shifts and light physical activity. Therefore, the most logical and low-cost prevention from obesity and abdominal obesity is to correct life style of this group. Accordingly, knowing their nutritional pattern and obesity is very important. Hence, this study was conducted to determine the relationship between energy and macronutrient intake with females' abdominal obesity.

Materials and Methods

Study participants: This cross-sectional analytic-descriptive study was conducted on female nurses of Vase'e hospital medical staff in Sabzevar, Iran. After getting permission from officials, 225 nurses and paraclinic workers entered the study by a census sampling method. All the participants were interviewed face to face and privately by an educated and experienced researcher.

Measurements: Then height and weight of the participants with the least clothes and shoes by a Seca digital scale and a tape measure were recorded in accordance with the standard

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guidelines of measurement and error measurement of 100 g and 1 cm, respectively. In order to reduce individual error, all measurements were taken by the same technician. The BMI was calculated as weight in kilograms divided by height in meters squared. The waist circumference (WC) was measured in a region in the middle of the lowest rib and superior edge of pelvic using a non stretched tape measure and an accuracy of 0.1 cm in a standing position and without any extra clothing. Then, the hip circumference (HC) was measured in the same conditions in a region of greater trochanter of femur bone which is equal to the biggest hip circumference. The Waist to hip ratio (WHR) used as a fat distribution index in the body which is obtained by dividing WC by HC (World Health Organization, 2000) and calculated for all the participants. In this study the WHR > 0.8 was known as abdominal obesity (Hammond, 2004). In order to assess the dietary intake, participants' common diets were assessed by the semi-quantitative food frequency questionnaire (FFQ). This standard questionnaire includes 168 kinds of foods and their amounts are determined. Indeed, the participant himself determines how many times and how much food he consumes in the last year by using this questionnaire. Then the reports for each food is converted to gram by using household measures guidelines (Ghafarpour *et al.*, 1999). Therefore, any food coded according to the Nutritionist IV (N Squared Computing, San Bruno, Calif., USA) program and using related software to evaluate the energy and macronutrients.

Data analysis: Gathered data were analyzed using SPSS-16 software and descriptive (mean, standard deviation, Pearson coefficient) and analytic (ANOVA, one sample *t- test*) statistics.

Ethical considerations: The study protocol was in accordance to the ethical principles of the Declaration of Helsinki. All participants were informed form the study procedure and signed written informed consent.

Results

The participants' Mean age was 30.5 ± 5.62 years. The mean and standard deviation of the participants for WC, HC, WHR, weight and BMI are presented in **Table 1**.

In this study, 21.3% of the participants were overweight and 5.2% were obese and 43.9% had abdominal obesity. Normal persons have been doing exercise for 5 ± 2.5 hours in a week, which it was 3.12 ± 1.5 in overweight persons and 3.35 ± 1.20 in persons with abdominal obesity ($P < 0.05$).

The mean and standard deviation of macronutrients intake in the participants are showed in **Table 2**.

The relationship between abdominal obesity with energy and macronutrients intake in assessed participants are revealed in **Table 3**.

In this research study, no significant correlation was found between abdominal obesity and energy and intake macronutrients.

In this study, the most widely used fatty foods (diets which more than 20% of their energy supported by fat) include milk, cheese, yogurt, red meat, chicken, fatty stew, egg, sauce, sausage, dried potato, shortcake, and the most widely used nuts, chocolates, kinds of cake and seeds consumed by assessed women were investigated.

Table 1. Mean and standard deviation of assessed anthropometric indices

Anthropometric indices	Mean ± S.D
Weight (kg)	60.39 ± 9.35
Body mass index (kg/m^2)	23.38 ± 3.64
Waist circumference (cm)	80.73 ± 12.58
Hip circumference (cm)	102.29 ± 11.57
Waist hip ratio	0.87 ± 0.15

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Table 2. Mean amounts of daily macronutrients intake in assessed women in comparison with the standard intake

Anthropometric indices	Mean ± S.D	Adequate intake	P-value[a]
Energy (kcal)	2113 ± 780	1800	<0.0001
Total fat (g)	67.13 ± 10.20	60	<0.001
SFA (g)	27.01 ± 8.52	< 10 % kcal	<0.001
MUFA (g)	16.28 ± 9.15	15 % kcal	<0.0001
PUFA (g)	5.70 ± 3.50	< 10 % kcal	<0.0001
Cholesterol (mg)	189.86 ± 185.50	300	<0.0001
Protein (g)	76.6 ± 29.20	46	<0.0001
Carbohydrate (g)	286.5 ± 142.10	170	<0.0001
Fiber (g)	12.23 ± 8.02	20-25	<0.0001

[a]: Versus the standard nutritional intake, SFA: Saturated fatty acid, MUFA: Monounsaturated fatty acid, PUFA: Poly unsaturated fatty acid.

Table 3. The relationship between the WHR with energy and macronutrients intake in assessed women

	Kcal	Fat	SFA	MUFA	PUFA	Cholesterol	Protein	Carbohydrate	Fiber
Correlation coefficient	0.012	0.018	0.081	0.017	-0.59	0.064	0.008	0.023	-0.04
P-value	0.086	0.80	0.25	0.81	0.4	0.36	0.9	0.745	0.56

SFA: Saturated fatty acid, MUFA: Monounsaturated fatty acid, PUFA: Poly unsaturated fatty acid.

Discussion

Few studies have investigated multiple measures of adiposity (BMI, WC, WHR, percent of body fat) in relation to diet quality. Recently, the New Zealand Adult Nutrition Survey was used to examine the association between more than one adiposity measure (BMI and WC) and diet quality (DeClercq *et al.*, 2017).This study has been conducted to assess the relationship between abdominal obesity with energy and macronutrients intake. The findings showed that mean of WHR 0.87 ± 0.15 according to the WHR criterion and abdominal obesity incidence in women was 43.9%, which was in accordance with Hajian et al. In Hajian's study, the WHR mean in women was 0.83 ± 0.09 and the incidence of abdominal obesity was 40% (Hajian and Hiedari, 2006). In Khoshknab's study, the WHR mean in women was reported 0.9 which is not in consistence with the present study (Khoshknab *et al.*, 2011). In De Marins et al study, incidence of abdominal obesity was 39.2% which was greatly in accordance with the present study(de Marins *et al.*, 2001). However, it was in contrast with Al-Riyami and Azadbakht's findings (Al-Riyami and Afifi, 2003, Azadbakht *et al.*, 2005). They reported the incidence of abdominal obesity about 64.6- 66.1% which it seems higher than the findings in the current study; this difference may be due to some differences in sampling method, and cultural, economic, social, and occupational factors of study participants.

The main factor of obesity in European countries has been mentioned high consumption of energy and fat (Robertson, 2000). The mean of energy and fat intake was 2113 kcal and 67 g in the present study which was nearly consistent with the obtained amounts by Barzin et al (Barzin *et al.*, 2009); however, it is greater than reported amounts in 19-34 year old women in Baltic Republic (Pomerleau *et al.*, 2001). Other studies on 20- 29 year old women in Isfahan (Rafiei *et al.*, 2002) and also glucose and lipid study in 2005 (Mirmiran *et al.*, 2003) reported similar findings for energy and fat intake. The mean of carbohydrate and protein by female participants in the present study were 286 and 76 g, respectively, which were lower than

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carbohydrate and protein intake by Tehranian women participating in Barzin study (331.72 and 87.43 g) (Barzin *et al.*, 2009). 16- 18 year old Felemengi girls have taken more protein and fat but equal carbohydrate in comparison with the present study (Matthys *et al.*, 2003); these differences may be due to using different methods to assess nutritional intake, different software to analyze data and underreporting nutritional intake effect. In study of New Zealand, an inverse association was reported between both BMI and waist circumference, and a "healthy" dietary pattern (characterized by high intake of breakfast cereal, low fat milk, soy and rice milk, soup and stock, yoghurt, fruit and tea, and low intakes of pies and pastries, potato chips, white bread, takeaway foods, soft drinks, beer and wine) compared to a "traditional" dietary pattern (characterized by high intake of beef, starchy vegetables, green vegetables, carrots, tomatoes, savory sauces, regular milk, cream, sugar, tea and coffee, and low intake of takeaway foods) (DeClercq *et al.*, 2017). A study conducted in Quebec, Canada demonstrated that individuals having high score of Western pattern were more BMI, WC, and fat mass; conversely, those in the high score Prudent pattern were less in the BMI, WC, and fat mass (Paradis *et al.*, 2009).

In 10 past years ago, in nutritional transition, the present evidences suggest the increase of fat intake in Iranian families. So that, in all the country, energy percent supplied by fat intake has been increased from %22 to %28 (Kalantari *et al.*, 2005).

In the present study, there was no significant correlation between women's abdominal obesity with energy rate, fat, saturated and unsaturated fat, cholesterol, carbohydrate, protein and fiber which were taken daily. In line with this finding, and the studies in different regions of Tehran (Barzin *et al.*, 2009, Pouraram *et al.*, 2013), Abtahi's study did not show a significant correlation between abdominal obesity with fat, energy and the other macronutrients intake (Abtahi *et al.*, 2013).

Some researchers have stated that the phenomenon of nutritional intake has been observed more in persons who are affected by the overweight and obesity, and the incidence of this phenomenon in women is more than men and in younger groups which are effective in obtaining such these results (Johansson *et al.*, 1998).

On the other hand, in addition to nutritional intake, reduction of physical activity in recent years causes increasing weight. The reduction of physical activity is due to developing industrial societies and consecutive changes in people's life style. In the present study, the rate of physical activity in people with overweight and abdominal obesity was less than normal people, which confirms this issue.

Conclusion

Female nurses and medical staffs take more energy and macronutrients intake. This can be due to consuming high caloric and fatty diets, fast foods and some other dairy groups and red meat. In assessed women, overweight and abdominal obesity has a great incidence and correcting habits and patterns of consuming nutrients can play an effective role in weight control and female obesity pattern.

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Authors' Contribution

All authors equally contributed to this project and article. All authors read and approved the final manuscript.

Conflict of Interest

The authors have declared no conflict of interest.

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