

The Relationship Between Body Weight and Stress and Nutritional Status in Turkish Women

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Abstract: The aim of this study was to examine the effects of body weight on stress and nutrition in women. Data were gathered from 889 women living in Turkey. The participants were selected randomly. Women were informed that the purpose of the study was to gather information on stress and nutrition and each participant attended a face-to-face interview. Subjects were administered a questionnaire containing demographic profile, anthropometric measurements, daily energy and macro-nutrients intakes, Stress Scale were used for descriptive purposes. Stress Symptom Scale, Stress Related Factors, Susceptibility to Stress Scale and Total Score were significantly associated with Body Mass Index (BMI) and daily energy and nutrients intake. Underweight and obese women had higher stress scores than normal weight women ($p < 0.0001$). Normal weight women had a higher level of stress susceptibility to stress scale than underweight and obese women ($p < 0.0001$). In addition, it was found that there was a correlation between women's daily energy and nutrient consumption and their stress-related factors, stress symptoms scale, susceptibility to stress scale and total stress scores ($p < 0.05$ and $p < 0.0001$). The results suggest that, increased stress was strongly associated with body composition and daily energy and nutrients intake among Turkish women.

Key words: Stress, body weight, nutrient intake, women

Introduction

Stress affects health not only through direct psychophysiological processes, but also by modifying behaviors that affect health, such as physical exercise, smoking and food choices (Streptoe *et al.*, 1998). Nutrition can alter mood and neural sensitivity, which in turn can affect reactions to stressors. Arousal can change metabolism and eating behavior, but dietary habits can also change sensitivity to stressors. Eating right is just as important as managing stress, because vulnerability to stress increases with poor diet (Rice, 1999). Stress changes water balance, suppresses the immune system and increases carbohydrate and protein metabolism (Niaura *et al.*, 1992; Rice, 1999). Carbohydrate consumption results in the production of the amino acid tryptophan in large amounts in the brain and results in the elimination of worry and the promotion of mental relaxation and mental nervous system disorders (Baysal, 2000; Baltao and Baltao, 2000). A lack of tryptophan results in mental nervous system disorders (Baysal, 1999). In times of stress, in order to have the nervous and gastrointestinal systems work properly, the requirement for B-complex vitamins increases. The lack of these vitamins increases stress and decreases the ability to cope with stress. Vitamins B6 and B12 have important roles in the functioning of brain cells (Thomas and Earl, 1994). Vitamin C and the B group of vitamins, calcium, magnesium and copper are nutrients, which are always required in stress and in the functioning of nerves. Moreover, vitamin A, thiamin,

B6 and B12 deficiency cause, fatigue, nervous system sensitivity and problems, depression and mental confusion. (Ekin, 1988; Ziegler and Filer, 1996). The aim of this study was to examine the effects of body weight on stress and nutritional status in a sample group of women.

Materials and Methods

Subjects and study design: Randomly selected women aged 20 to 50 years from 6 primary school's teachers and their student's mothers (n:889) which are in Ankara, Turkey, completed the survey in January-April, 2005. Subjects were briefed about the purpose of the study and about right to participate in the study. The questionnaire took 30 min to fill in.

Survey methods: After a pilot testing on 110 women and revision, the survey consisted of following:

Demographic questions that included age, education level, marital status and profession

Anthropometric measurements: Height was measured to the nearest 0.1 cm and weight to nearest 0.5 kg in light clothing and without shoes. BMI was calculated as weight (kg)/height (m²). Those having BMI below 18.5 kg/m² were considered underweight, those who weighted between 18.5-24.9 kg/m² were normal, above 25 were considered overweight (WHO, 2000). All measurements were performed by 2 trained dietitians and as recommended (Gibson, 1990).

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Table 1: General characteristics (n = 889)

Characteristics	n	%		n	%
Age (years)			Marital status		
20-25	198	22.3	Married	716	80.5
26-35	331	37.2	Single	173	19.5
36-45	275	30.9			
46 and above	85	9.6			
Education level			Profession		
Primary	15	1.7	Housewife	460	51.7
Junior high school	350	39.4	Employee	414	46.5
High school	145	16.3	Worker	28	3.1
University	379	42.6	Self-employed	15	1.7

Table 2: Women's body weight, height and BMI values

	Mean±SD Range
Weight (kg)	62.4 ± 9.8 (40.0-95.0)
Height (cm)	160.8±13.9 (141.0-183.0)
BMI (kg/m ²)	23.4± 3.9 (14.0-37.0)

Dietary assessment: Food consumption of women was assessed by the 24 h recall technique on 3 consecutive days. The 3 days included 1 weekend day and previous or next two days (Sunday, Monday, Tuesday or Thursday, Friday, Saturday).

Dietary data was collected from women during a face-to-face interview with trained two dietitians. Dietitians were trained a group to minimize interobserver variation. During the interview, food models and photos of common Turkish dishes of various portions, as well as household cups and measures, were used to define amounts regarding the type and amount of food and beverages consumed during the previous day. The average energy, micro nutrients and macro nutrients intake were calculated by computer program that includes the Turkish Food Composition Tables (Baysal, 1991).

Stress scale: This scale is used to measure 13 primary symptom dimensions and 3 global indices. In the present study; the Stress Symptoms Scale (total 70 questions, 10 each on muscle system, parasympathetic nervous system, sympathetic nervous system, emotional, cognitive, endocrine and immune system. Answers are on a 5-point scale, from 1: "not at all" to 5: "extremely") and Stress Related Factors (total 141 questions, family life (30), individual role (25), social self (19), environmental (14), financial/ economic (15), job (38) answers are on a 5-point scale from 1: "not at all" to 5: "extremely") and Susceptibility to Stress Scale (20 questions, answers on a 5-point scale, from 1: "extremely" to 5: "not at all") were used (Miller *et al.*, 1988; Sahin and Durak, 1995). In this study, Stress Scales internal reliability coefficient (Cronbach's alpha) was 0.75.

Statistical analyses: The data were analyzed with SPSS for Windows 10.0 (SPSS Inc., Chicago, IL, USA). The results are expressed as mean and standard deviation. Of the demographic characteristics of the study group,

frequency and percentage values of the variables of age, educational level and marital and work statuses were given. The effect of stress on women's health was analyzed with correlation coefficient (r) and ANOVA test, whether it was statistically meaningful depending on the variable of women as stress related factors, stress symptoms, stress aptitude, daily energy and nutrient intake and obesity status. In all analyses a 5% significance level was used.

Results

The descriptive characteristics of sample are presented in Table 1. Among the study women, 68.1% were 26-45 years old and 42.6% of the women graduated from primary school and university. In addition, 80.5% of the women were married, 19.5% were single and 48.2% were working, while the other 51.7% were non-working (housewife).

In Table 2, the average, standard deviation, minimum and maximum weight, height and BMI values are shown. Women's average body weight was 62.4 kg, height was 160.8 cm and BMI was 23.4 kg/m². According to BMI, 15.0% of the women were underweight, 49.2% were normal weight and 35.8% were obese.

Stress factors in underweight women on the subscale of family issues (71.9) had a higher average score compared to normal weight women (60.9) and obese women (66.8). It was determined that there was a statistically meaningful difference between the 3 groups (underweight, normal weight and obese women) ($p < 0.05$).

According to BMI, stress related factors, social self-issues (44.4, 38.2, 39.9; $p < 0.05$), individual role-issues (66.3, 55.4, 62.1; $p < 0.0001$) and financial issues (42.2, 35.2, 42.7; $p < 0.0001$), respectively showed meaningful differences.

It was observed that obese women had a higher average score on muscle system (17.9, 17.4, 20.8), parasympathetic nervous system (19.0, 18.9, 21.6), sympathetic nervous system (16.2, 15.9, 21.4) and emotional system (15.5, 11.9, 16.0) than underweight and normal weight women. There were significant differences in all stress symptoms scales between underweight, normal weight and obese women ($p < 0.0001$).

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Table 3: Women's stress factors, stress symptoms and stress affinity according to BMI (n = 889)

Stress Scales	Under weight (n = 134)		Normal weight (n = 437)		Obese (n = 318)		F	p value
	\bar{x}	S	\bar{x}	S	\bar{x}	S		
Stress Related Factors								
Family issues	71.9	30.8	60.9	29.5	66.8	32.7	7.66	0.001*
Individual issues	66.3	19.4	55.4	22.3	62.1	17.9	13.55	0.00**
Social self-issues	44.4	19.7	38.2	20.0	39.9	22.8	4.52	0.011*
Environmental issues	41.3	12.8	39.4	13.8	40.6	15.4	1.21	0.298
Financial issues	42.2	14.6	35.2	16.4	42.7	19.2	20.55	0.00**
Stress Symptoms Scale								
Muscular system	17.9	9.3	17.4	12.1	20.8	13.7	7.199	0.001*
Parasympathetic system	19.0	9.6	18.9	10.7	21.6	13.3	5.66	0.004*
Sympathetic system	16.2	9.9	15.9	11.7	21.4	15.5	17.63	0.00**
Emotional system	32.0	12.1	27.5	11.5	31.1	13.5	11.41	0.00**
Cognitive system	28.2	12.6	22.1	12.4	25.7	13.5	14.71	0.00**
Endocrine system	15.5	9.4	11.9	9.2	16.0	12.3	15.12	0.00**
Immune system	16.9	10.4	13.3	10.5	16.2	13.2	8.47	0.00**
Susceptibility to Stress Scale	74.8	12.2	77.3	9.2	70.2	9.7	47.56	0.00**
Total score	560.5	151.1	489.2	168.9	502.6	189.5	8.6	0.00**

*p<0.005 **p<0.0001

Table 4: The correlation coefficients between Stress-Related Factors, Stress Symptoms Scale, Susceptibility to Stress Scale and nutritional status of the women

	Correlation coefficient (r)			
	Total Stress Score	Stress Related Factors	Stress Symptoms Scale	Susceptibility to Stress Scale
Weight	-0.09	-0.11	0.02	0.30**
BMI	-0.02	-0.08*	0.14**	-0.29**
Energy (kcal)	0.11**	0.04	0.23**	-0.31**
Protein (g)	0.11**	0.06	0.21**	-0.24**
Protein (%)	0.03	0.06	-0.05	0.1**
Carbohydrate (g)	0.06	-0.002	0.21**	-0.33**
Carbohydrate (%)	-0.02	-0.06	0.09**	-0.18**
Fat (%)	0.01	0.04	-0.08*	0.16**
Fat (g)	0.12**	0.09**	0.17**	-0.15**
Fiber (g)	-0.06	-0.09**	0.03	-0.08*
Calcium (mg)	0.02	-0.02	0.10**	-0.11**
Iron (mg)	-0.08*	-0.08*	-0.06	-0.11**
Vitamin A (IU)	0.08*	0.06	0.09*	0.02
Thiamine (mg)	0.002	-0.03	0.08*	-0.12**
Riboflavin (mg)	-0.04	-0.06	0.03	-0.15**
Niacin (mg)	0.004	-0.01	0.02	-0.09**
Vitamin C (mg)	-0.04	-0.06	-0.003	0.05
Copper (mg)	-0.005	-0.08*	0.16**	-0.21**
Zinc (mg)	0.16**	0.18**	0.08*	-0.02

*p<0.05 **p<0.0001

On stress susceptibility to stress scale, normal weight women (77.3) had a higher average score compared to underweight women (74.8) and obese women (70.2). There were significant differences between all women on stress susceptibility to stress scale (p<0.0001).

It was observed that total average score of underweight women (560.5) was higher than normal weight women (489.2) and obese women (502.6). It was determined that there was a significant difference between the total scores of the stress scale (p<0.0001).

It was found that there was a statistically significant difference between women's stress-related factors and daily energy (p<0.05), fat (p<0.0001), fiber (p<0.0001), copper (p<0.05), zinc (p<0.0001), calcium and vitamin A

consumption. Furthermore, there was also a significant relationship between women's stress scores and energy, protein, fat, zinc (p<0.0001) iron and vitamin A consumption.

Discussion

In this study, it was determined that underweight and obese women had a higher average score compared to normal weight women on family issues within the stress factors scale. The majority of the study women were married. There is a traditional family life in Turkey. Women are still responsible for the household duties and also work outside the home. Most of them are affected by the stress of family and personal

relationships (Anonymous, 2006). MacDonald *et al.* (2005) examined gender differences of the impact of paid and unpaid productive activities on well-being. They showed that women's longer hours of unpaid work contribute to women experiencing more stress than men do and that hours spent on household work were more stressful than those spent on child care. Warner (2005) said that constant stress at work or at home may be more dangerous for women than men. Kim *et al.* (2005) studied the relationship of work stress and family stress to the health of women in Korea. They found that there was a significant positive relationship between social support and perceived health status, but a significant negative relationship between perceived health status and work stress, as well as family stress. Therefore, studies designed for these kinds of symptoms were used in some of the instruments to determine problems such as depression, anxiety or stress (DasGupta, 1992; Sahin, 1995). These findings confirm the results of the present study. Some stress symptoms are disorders like the lack of appetite or excessive eating behaviors (Stone and Brownell, 1994; Sahin, 2000; Öanlzer, 2003; Unusan, 2006). As it is well-known, changes in nutritional habits, irregular nutrition, eating too little, or eating too much are some of the psychological symptoms that are usually observed (Sonneck *et al.*, 2000). Research findings showed a significant correlation between psychiatric symptoms and nutritional disorders such as anorexia nervosa, obesity and bulimia nervosa, where such symptoms were observed more intensively in underweight and obese women (Baysal, 1999; Erol *et al.*, 2000).

The findings also prove the view that focuses on the interaction between weight and psychological disorders (Baysal, 1999). In the subscales of muscle, parasympathetic nervous, sympathetic nervous and endocrine systems of the stress symptoms, obese women had higher scores compared to underweight and normal weight women and the difference was very statistically significant ($p < 0.0001$). Other Stress Symptoms, Susceptibility to Stress Scale and Total Score in underweight women were higher than obese and normal weight women. Excess weight creates serious problems such as feeling ashamed, guilty and depressed, which lead to psychological problems (Bartlett *et al.*, 1996). In the study Black *et al.* (1992) made with adults with severe obesity, problems like anxiety, nicotine addiction and bulimia nervosa were observed. In another study of individuals with obesity and other health problems, it was shown that the obese individuals' depression and anxiety scores increased moderately. In addition, it was shown that findings like dysphoria, anxiety, depression and stress are more the results of obesity rather than obesity (Bayraktar, 1999). These findings confirmed the results of this study. It was found that there is a significant relationship between

body weight, BMI, susceptibility to stress scale and stress symptoms. The role of nutrition on neurological and psychiatric disorders doesn't explore certain results; the auxiliary role of nutrition in treatment has been accepted by the experts (Baysal, 1999). As it is known, the effect of and the importance of balanced nutrition in dealing with stress shouldn't be rejected (Öahin, 1998). It was found that there are significant relationships among women's daily energy consumption and nutrients intake and stress symptoms and stress related factors. The role of dietary habits and nutritional status are not ignored coping with stress and neurological and psychiatric breakdowns. It has been stated that some foods lead to increased stress reactions, making individuals much more sensitive towards stress (Eloinia, 1999). Insufficient and unbalanced diet might give rise to forgetfulness, uneasiness, irritability, erratic thinking and mental disorders (Baysal, 1999). Stress has a big role in dysfunctions like eating slowly or fast (Heatherton *et al.*, 1991). In some individuals under stress, while energy and fat intake increases (McCann *et al.*, 1990; Michaud, 1990; Weildner, 1996), in others there is none (Bellisle, 1990; Pollard, 1995). Excess fat will cause excess weight gain and this will lead to an increase in stress. Under stress conditions, while some people eat more, others consume less (Stone and Brownell, 1994; Öanlzer, 2003). However, it has been observed that in some individuals under stress, a decrease in appetite and food consumption is observed. The main reason for this is that in less-food-consuming individuals, under stress there is an increase in the activity of sympathetic nervous system (Schachter *et al.*, 1972). There is a reciprocal relationship between being stressed and fruit and vegetable consumption. Individuals under stress don't consume healthy foods like fruits and vegetables; due to less consumption of fruits and vegetables, they are under stress for long periods of time (Cohen and Kristal, 2002; Unusan, 2006).

In this study it was determined that, according to RDA, the women's daily thiamine, niacin, vitamin A, calcium and iron consumption were insufficient. In order to have the nervous system and internal secretion glands work properly, B-complex vitamins and vitamin C are required. The deficiency of B vitamins plays a significant role in stress reactions. In addition, thiamine has a significant role on the nervous system. The lack of thiamine results in problems like anxiety, depression and sleeplessness (Öahin, 1998). Moreover, the deficiency of pantothenic acid and pyridoxine causes anxiety reactions, depression, sleeplessness and cardiovascular diseases. The lack of riboflavin and niacin leads to excess sensitivity of the gastrointestinal system and muscular weakness. Thiamine, riboflavin and niacin in carbohydrate metabolism are consumed more under stress. In extended periods of stress conditions, these

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vitamins in the body are consumed; therefore, individuals are affected more from the stress factors and the side effects of water-soluble vitamins (Sezgin, 1998). Individuals who are under stress can easily consume unhealthy foods (Cargill *et al.*, 1999). The need for vitamin C increases in individuals under stress (Rowshan, 2000), while the consumption of glucose, which is the only energy source for the brain, in larger quantities, causes deficiency of B vitamins and reduces resistance to stress. Insufficient intake of folic acid, serotonin and selenium leads to anxiety and hypersensitivity; insufficient choline intake results in problems related to memory and concentration (Rodwell, 1989; Öahin, 1998). Iron is effective on cognitive performance. Calcium is effective on nerve transmission and secretion of neurotransmitters from the synaptic connections (Arlı and Öanlıer, 1997). Large doses of vitamin A and D produce an immense array of negative effects, which cause a loss of appetite and weight, loss of hair, nausea, depression, anemia and increased brain and spinal fluid pressure with headache, etc. (Rice, 1999). In this study, we observed significant relationships between stress symptoms, affinity to stress, stress factors, stress scores and consumption of energy and food items. The findings also support the results of this study.

conclusion: The results of this study indicate that stress has a significant role contributing to underweight and overweight status and energy and food item consumption. Irregular nutrition, insufficient nutrition and malnutrition cause obesity. This situation affects the psychology of women who are concerned with their bodies and leads to stress and health problems. A complete stress management program should be considered, in which a good diet and exercise program could improve a woman's ability to cope with stress. Poor diet can 'detune' the nervous system, causing individuals to become more irritable. Lack of exercise can lead to increased demands on the body that makes it more difficult to confront stressors (Rice, 1999). The study had several limitations. Unfortunately, there is less information and few documents available on this type of study, both in Turkey and worldwide. However, it is really very affirmative that the participants are voluntary. We think that this study will be a guide to future studies. Sufficient and balanced nutrition, suitable diet, exercise and stress management programs are necessary for every individual. Men and women alike should be educated and counseled on this subject.

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