

The association between ABO, RH blood types and eating behaviour

ABO ve RH kan tipleri ile yeme davranışı arasındaki ilişki

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ABSTRACT

Aim: The aim of the present study is to reveal controlled eating, uncontrolled eating and emotional eating behaviours in women referred to the outpatient clinic of Sports Physiology with complaints of obesity, and to search whether an association exists between ABO blood types as well as Rh factor and these behaviours using Three-Factor eating Questionnaire (TFEQ).

Method: The women between 18 and 65 years of age who referred because of obesity consisted the obesity group (n=197) whereas a control group (n=95) was created from non-obese women who referred to the blood bank as blood donors. Body heights of the women were measured at standing position without shoes. A complete blood analysis was performed including body weight, body mass index, fat percentage, fat weight and lean body weight through bio-impedance (Tanita-BC-418 MA III). The participants were asked to reply the three-factor Eating Questionnaire (TFEQ)-18 which is an international questionnaire evaluating controlled eating, uncontrolled eating and emotional eating behaviour. Blood type and Rh factor analyses were performed in the blood bank. The patient data collected within the scope of the study were analysed through IBM Statistical Package for the Social Sciences (SPSS) for Windows 20.0 package program.

Results: Cognitive restraint was detected to be higher in the blood type A when compared with blood type O whereas uncontrolled eating and emotional eating behaviour were not affected by ABO blood types and Rh factor.

Conclusion: A significant result for controlled restriction only in blood type A may guide new studies that will investigate the effect of ABO blood group antigens and Rh factors on eating behaviour.

Keywords: Obesity, blood groups, eating behaviour

ÖZ

Amaç: Çalışmamızın amacı, Spor Fizyolojisi Polikliniğine obezite nedeniyle başvuran kadınlarda Three-Factor Eating Questionnaire (TFEQ) kullanılarak kontrollü yeme, kontrolsüz yeme ve emosyonel yeme davranışını ortaya koymak ve bu davranışların ABO kan grupları ve Rh faktörü ile ilişkisinin olup olmadığını araştırmaktır.

Yöntem: On sekiz-altmış beş yaş arası obezite nedeniyle başvuran kadınlardan obezite grubu (n=197), kan bankasına kan donörü olarak başvuran obez olmayan kadınlardan kontrol grubu oluşturuldu (n= 95). Düz zeminde, çıplak ayakla boy uzunlukları ölçüldü. Daha sonra bioimpedans (Tanita-BC-418 MA III) cihazında kilo, beden kitle indeksi, yağ yüzdesi, yağ ağırlığı ve yağsız ağırlığı gösteren tüm vücut analizi yapıldı. Kontrollü yeme, kontrolsüz yeme ve emosyonel yeme davranışını ölçen uluslararası düzeyde kullanılan, ülkemizde uygunluğu gösterilmiş çalışmaları olan üç faktörlü beslenme anketini (Three-Factor Eating Questionnaire (TFEQ)-18) doldurmaları istendi. Kan grupları ve Rh faktörünün tayini kan bankasında gerçekleştirildi. Çalışma kapsamında toplanan hasta verileri IBM Statistical Package for the Social Sciences (SPSS) for Windows 20.0 paket programı ile analiz edildi.

Bulgular: Cognitive restraint (Bilişsel kısıtlama) A kan grubunda O grubuna göre daha yüksek oranda belirlenirken, kontrolsüz yeme ve emosyonel yeme davranışının ABO kan gruplarından ve Rh faktöründen etkilenmediği belirlendi.

Sonuç: Bu çalışmada yalnızca A kan grubunda kontrollü kısıtlama açısından anlamlı sonuç belirlenmesi ABO kan grubu antijenlerinin ve Rh faktörünün yeme davranışı üzerine etkisini araştırmak açısından daha yeni çalışmalara yol gösterici olabilir.

Anahtar kelimeler: Obesite, kan grupları, yeme davranışı

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INTRODUCTION

Since obesity is a significant health problem whose incidence increases rapidly all over the world; number of investigations on obesity also increase. Obesity is defined as a supraphysiological increase of adipose tissue in the body¹. Increase in adipose tissue leads to an increase in the risk of development of some diseases including Type 2 diabetes mellitus, coronary heart disease and cancer². Obesity has been known to have multifactorial etiology and also associated with the eating behaviour of the individual. Food type choice, food intake and meal time are determined by eating behaviour³. Eating behaviour may vary in certain cases such as different mood, environmental and social factors⁴. Therefore, it is important to understand why we eat.

Three-Factor Eating Questionnaire (TFEQV) is a method used for such objective which was firstly published by Stunkard and Messick in 1985. The questionnaire includes 51 items and evaluates the desire to eat in three categories as as restraint, disinhibition and hunger⁵. Later, Karlsson et al.⁶ revised the aforesaid questionnaire and limited with 18 questions which assess cognitive restraint, uncontrolled eating and emotional eating. The three eating behaviours assessed by TFEQ-18 include cognitive restraint (questions 2, 11, 12, 15, 16, and 18), uncontrolled eating (questions 1, 4, 5, 7, 8, 9, 13, 14 and 17) and emotional eating (questions 3, 6, and 10). Cognitive restraint is defined as being consciously careful in food selection not to gain weight⁷. Uncontrolled eating is defined as a strong desire for food consumption without thinking its consequences, emotional eating is also defined as increased food consumption in response to negative emotional stimuli such as anxiety, depression and anger^{6,8}.

ABO blood groups were first identified by Karl Landsteiner in 1901 according to presence of A and B antigens on membrane of red blood cells. Landsteiner and Alexander Wiener identified the Rh factor together in 1940-1941^{9,10}. The antigens of the ABO blood group system are complex carbohydrate molecules

on the extracellular surface of red blood cell membranes¹¹. ABO antigens are also highly expressed on the surface of a variety of human cells and tissues including the epithelium, sensory neurons, platelets, and the vascular endothelium¹². Although existence of the association between blood types and the mood is limited with previous studies, it was shown that groups O and B are active, aggressive, progressive, and positive; and groups A and AB are conservative, passive, defensive, negative personalities¹³. Since the association between the mood and eating behaviour is known, the aim of the present study is to show if any association exists between the blood types and eating behaviour¹⁴.

MATERIAL and METHODS

This study was conducted in the Sports Physiology Clinic of the Marmara University Pendik Training and Research Hospital, Istanbul, Turkey. The subjects in the obese group were the female outpatients of the clinic aged between 18 and 65 years old. A control group was created from non-obese individuals who referred to donate blood to the hospital's blood bank. Body height was measured on a flat surface without shoes; weight, BMI, fat percentage, fat mass and fat free mass of the patients were determined using a bio-impedance device (Tanita-BC-418 MA III). After collection of 2 ml of blood from each patient into EDTA containing tubes, ABO and Rh blood groups were determined via Forward Reverse Micro-lack method.

Statistical methods: The patient data collected within the scope of the study were analysed using IBM Statistical Package for the Social Sciences (SPSS) for Windows 20.0 package program. Frequency and percentage were used for discrete data whereas mean \pm standard deviation, median, minimum and maximum values were used for continuous data. The independent sample's T-test was used to compare averages of two groups whereas ANOVA test was utilized to compare averages of three groups. Chi-Square Test was used to compare two discrete groups. The change in questionnaire scores according to the study gro-

ups was examined; ANCOVA Test was used to analyse the effect of blood type. The p value below 0.05 was accepted as statistically significant.

Approval of the Ethics Committee: The present study was approved by the Research Ethics Committee. Participants were informed that their participation is completely voluntary; and written consent was obtained from each participant.

RESULTS

Table 1 shows average values for age, weight, body mass index, fat percentage, fat weight and fat -free weight of obese and control individuals who took part in our study. The average body weights for the obese, and the control groups were 90, and 55.8 kg, respectively.

Table 2 shows the distribution of blood groups. While obese group had a higher percentage of A blood type, O blood type percentage was higher in the control group.

Table 3 illustrates the Rh factor distribution. Both obese and control groups had higher percentage of Rh positive values.

Table 2. Distribution of Blood groups.

Blood Group	n	%	
Obesity (n=197)	O	57	28.9
	A	84	42.6
	B	29	14.7
	AB	27	13.7
Control (n=95)	O	40	42.1
	A	33	34.7
	B	15	15.8
	AB	7	7.4
Overall (n=292)	O	97	33.2
	A	117	40.1
	B	44	15.1
	AB	34	11.6

Table 3. Distribution of Rh factor.

Rh Factor	n	%	
Obesity (n=197)	Positive	177	89.8
	Negative	20	10.2
Control (n=95)	Positive	78	82.1
	Negative	17	17.9
Overall (n=292)	Positive	255	87.3
	Negative	37	12.7

The cognitive restraint was detected to be higher in blood group A than blood group O; and uncontrolled, and emotional eating behaviours were not affected by ABO blood groups and Rh factor (Tables 4, 5, 6).

Table 1. Distribution of demographic characteristics of the Participants.

		Age (year)	Height (cm)	Weight (kg)	Body Mass Index (BMI)	Body Fat Percentage	Body Fat Mass	Body Muscle Mass
Obesity (n=197)	Mean	33.7	159.9	90.1	35.2	40.8	37.9	52.2
	Median	34.0	159.0	84.4	33.4	40.0	33.	50.8
	Std. Deviation	7.6	6.2	22.6	7.8	6.8	15.7	7.6
	Minimum	17.0	143.0	55.8	24.3	25.6	15.6	38.4
	Maximum	54.0	180.0	167.6	65.5	63.1	99.0	77.6
Control (n=95)	Mean	30.7	161.0	55.8	21.4	24.0	14.0	41.6
	Median	30.0	161.0	55.0	21.1	24.0	13.5	41.6
	Std. Deviation	7.6	6.2	8.9	2.7	6.6	6.1	3.6
	Minimum	17.0	137.0	35.1	16.6	7.8	3.7	31.4
	Maximum	49.0	179.0	99.3	39.8	46.9	46.6	52.8
Overall (N=292)	Mean	32.7	160.3	78.9	30.7	35.3	30.2	48.8
	Median	33.0	160.0	74.9	29.7	36.3	27.1	47.8
	Std. Deviation	7.7	6.2	25.0	9.2	10.3	17.4	8.2
	Minimum	17.0	137.0	35.1	16.6	7.8	3.7	31.4
	Maximum	54.0	180.0	167.6	65.5	63.1	99.0	77.6

Table 4. Comparison results of subgroups of eating questionnaire according to blood groups.

Blood Group (Obesity)		n	Mean	Std. Deviation	p
Cognitive restraint	O	57	2.42	0.614	p<0.05
	A	84	2.73	0.588	
	B	29	2.70	0.623	
	AB	26	2.57	0.658	
Uncontrolled Eating	O	57	2.31	0.663	0.954
	A	84	2.24	0.669	
	B	29	2.29	0.716	
	AB	26	2.26	0.715	
Emotional Hunger	O	57	2.68	1.006	0.579
	A	84	2.45	0.985	
	B	29	2.51	0.932	
	AB	27	2.58	0.927	

Table 5. Results of subgroups of eating questionnaire according to Rh factor.

Rh Factor (Obesity)		n	Mean	Std. Deviation	p
Cognitive restraint	Positive	176	2.59	0.617	0.208
	Negative	20	2.78	0.642	
Uncontrolled Eating	Positive	176	2.29	0.661	0.360
	Negative	20	2.14	0.801	
Emotional Hunger	Positive	177	2.54	0.963	0.987
	Negative	20	2.55	1.088	
Rh Factor (Control)		n	Mean	Std. Deviation	P
Cognitive restraint	Positive	78	2.31	0.651	0.873
	Negative	17	2.28	0.606	
Uncontrolled Eating	Positive	78	1.99	0.624	0.852
	Negative	17	1.96	0.620	
Emotional Hunger	Positive	78	1.93	0.787	0.732
	Negative	17	1.86	0.825	

Table 6. Results of subgroups of eating questionnaire according to blood groups.

Blood Group (Control)		n	Mean	Std. Deviation	p
Cognitive restraint	O	40	2.31	0.639	0.740
	A	33	2.32	0.655	
	B	15	2.35	0.666	
	AB	7	2.04	0.598	
Uncontrolled Eating	O	40	2.00	0.584	0.476
	A	33	1.90	0.662	
	B	15	1.99	0.576	
	AB	7	2.31	0.735	
Emotional Hunger	O	40	1.99	0.821	0.763
	A	33	1.82	0.791	
	B	15	1.86	0.814	
	AB	7	2.09	0.629	

Table 7. Evaluation of eating behaviours according to groups.

	Group	n	Mean	Std. Deviation	p
Cognitive Restraint	Obesity	196	2.61	0.620	p<0.0.1
	Control	95	2.30	0.640	
Uncontrolled Eating	Obesity	196	2.27	0.676	p<0.0.5
	Control	95	1.99	0.620	
Emotional Hunger	Obesity	197	2.54	0.973	p<0.0.1
	Control	95	1.92	0.790	

DISCUSSION

The frequency of cognitive restraint was detected to be higher in obese people with blood type A when compared to those with blood type O; it was also detected that uncontrolled eating and emotional behaviours are not affected by ABO blood groups and Rh factor.

The association between eating behaviours and obesity:

There are studies suggesting that eating behaviour is an important factor for obesity and depends on BMI and gender. It was shown that uncontrolled eating, cognitive restraint and emotional eating behaviour increase with increasing BMI¹⁵. Restraint and Disinhibition scores were shown to be higher in females when compared with males¹⁶. In a study where TFEQ was used, it was noted that women who had higher levels of worry and anxiety more frequently displayed much higher level of emotional eating behavior¹⁷. In a study carried out with two groups including non-obese adults and teenagers, cognitive restraint (CR) and emotional eating (EE) were detected more frequently in females of both groups according to TFEQ-R18 scores¹⁸. The cognitive restraint scale scores were found to be significantly lower whereas uncontrolled eating and emotional eating scale scores were detected to be lower in the individuals with lower BMI when compared to overweighted individuals in a study conducted on adolescents between 17 and 19 years of age in Kırklareli University; however, the results were not statistically significant¹⁹. In the present study, uncontrolled eating, cognitive restraint and emotional eating behaviour appears to be more frequent in the obesity group when compared with the control

groups (Table 7). Although there is not any significant difference between groups A and O in terms of body weight and BMI, while restriction behaviour was less frequently detected in patients with blood group A when compared with those with group O.

The association between the blood groups and obesity:

There are studies suggesting the possible association between obesity and blood groups. In a study conducted on Turkish seafarers, groups AB Rh (+) and AB Rh (-) were associated with the highest (13.7% and 13.6%, respectively) and B Rh (+) and B Rh (-) with the lowest percentages (11.6% and 11.3%, respectively) of obese subjects²⁰. The individuals with B Rh (+) blood type were found to be more susceptible for obesity. This case was explained by the assertion that patients with blood group B may be more inclined to obesity^{21,22}. However, there was not any association detected between obesity and blood groups in a study conducted in Saudi Arabia²³.

The association between blood groups and diseases:

It was considered in 1953 that the individuals with A blood group had more risk for gastric cancer²⁴, in another study, the non-O blood groups were found to be associated with renal cell cancer, coronary artery disease, myocardial infarction, venous thrombosis²⁵⁻²⁷ which was suggested as dependent to the antigens and ABO locus. The significance in controlled restriction behaviours in the blood group A in the present study supports the aforesaid studies suggesting the possible effect of antigen and gene locus.

The association between the blood groups and mood:

Despite conflicting outcomes, there are studies suggesting the association between blood groups and psychiatric diseases. The studies have detected that psychiatric diseases are three-fold more common in individuals with AB blood groups when compared with other groups²⁸. Groups A and O were found

to be genetically associated with schizophrenia and depression, respectively²⁹.

In previous studies, dopamine-3-hydroxylase enzyme activity which induces transformation of dopamine to norepinephrine was found to be lower in blood group O; therefore the individuals with blood group O were considered as more susceptible for psychiatric diseases. Dopamine-3-hydroxylase enzyme activity was shown to be controlled by a locus dependent on ABO blood group locus³⁰⁻³².

Despite different incidence rates and conflicting studies, the association shown between depression and blood groups is considered to affect eating behaviour. The association between emotional eating behaviour and depression is well known³³. It is also known that such eating behaviour uses the dependence mechanism³⁴. Existence of an association between AB, Rh negative blood group and opioid addiction was considered to be related to locus of a gene on chromosome 6³⁵. However, any association between Rh factor and emotional eating behaviour could not be detected in the present study.

CONCLUSIONS

Since the association between obesity and diseases is known, we wanted to show the effects of blood groups on eating behaviours due to the blood group antigens. However, we believe that the significant result obtained in blood group A only would guide the further studies that will search the effect of blood group antigens and ABO gene locus on eating behaviour.

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