T.C.
YEDITEPE UNIVERSITY
INSTITUTE OF HEALTH SCIENCES
DEPARTMENT OF NUTRITION AND DIETETICS

DETERMINATION OF OVERWEIGHT AND OBESE INDIVIDUAL'S METABOLIC SYNDROME RISK LEVELS AND COMPARISON OF EATING HABITS WHO ADMITTED TO A SPECIAL HOSPITAL DIET

MASTER OF SCIENCE THESIS

ÖZGE YÜKSEL

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SUPERVISOR
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ONAY

Bu tez Yeditepe Üniversitesi Lisansüstü Eğitim-Öğretim ve Sınav Yönetmeliğinin ilgili maddeleri uyarınca yukarıdaki jüri tarafından uygun görülmüş ve Enstitü Yönetim Kurulu'nun 02./05./2016 tarih ve 10-1 sayılı kararı ile onaylanmıştır.

İmza

Prof. Dr. Bayram YILMAZ

Sağlık Bilimleri Enstitüsü Müdürü

DECLERATION

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree except where due acknowledgement has been made in the text.

Özge YÜKSEL

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LIST OF SYMBOLS AND ABBREVIATIONS

ATP III	Adult Treatment Panel III
BMI	Body Mass Index
CRP	C Reactive Protein
GI	Glisemic Index
HDL	High Density Lipoprotein
LDL	Low Density Lipoprotein
MS	Metabolic Syndrome
MSRF	Metabolic Syndrome Research Form
NCEP	National Cholesterol Education Program
OGTT	Oral Glucose Tolerance Test
TNF ALFA	Tumor Necrosis Factor Alfa
VLDL	Very Low Density Lipoprotein
WHO	World Health Organisation

ÖZET

Konu : Özel Bir Hastanenin Diyet Polikliniğine Başvuran Kilolu ve Obez Bireylerin Metabolik Sendrom Risk Düzeylerinin Belirlenmesi ve Riskli Bireylerin Beslenme Alışkanlıklarının Karşılaştırılması

Amaç : Metabolik sendrom genetik veya çevresel etkenlerle ortaya çıkan birden fazla kardiyovasküler faktörün oluşturduğu bir hastalık grubudur. Dünya üzerinde görülme sıklığı son yıllarda oldukça artmış olan mortalite ve morbiditeyi arttırıcı etkisi bulunan önemli bir hastalıktır. Çalışmada, erişkinler arasındaki metabolik sendrom risk düzeyleri ve beslenme alışkanlıklarının incelenmesi amaçlandı.

Yöntem : Çalışmaya 18 yaş ve üzerinde 70 birey alındı. Çalışmaya Aralık 2014 ile Mart 2015 arasında özel bir hastanenin polikliniğine başvuran 35 obez ve kilolu kadın ile 35 obez ve kilolu erkek katıldı. Datalar kişisel bilgiler formu, metabolik sendrom araştırma formu ve besin tüketim sıklığı anketiyle toplandı.

Bulgular : Çalışmanın sonucuna göre metabolik sendrom risk düzeyinin yaş ve kilo ile arttıkça arttığı boy uzadıkça azaldığı görülmüştür. Fiziksel aktivitenin sıklığının ölçülmesindense hacminin değerlendirilmesi gerektiği, öğün aralarında yapılan atıştırmalıkların metabolik sendrom risk düzeyi arttırabileceği görülmüştür. Yüksek glisemik indekse sahip gıdalar, endüstriyel gıdalar ve az yağlı süt ürünleri, kuru meyve ve kurubaklagiller metabolik sendrom risk düzeyleri ile ilişkili bulunmuştur.

Sonuç : Medikal diyet tedavisi metabolik sendromu etkileyen kronik hastalıkların tedavisinde ve önlenmesinde önemlidir. Beslenme alışkanlıkları ve metabolik sendrom risk düzeyleri prospektif çalışmalarla daha detaylı incelenmelidir.

Anahtar kelimeler : Metabolik sendrom, Beslenme alışkanlıkları, Obezite, Kronik hastalık, İnsülin direnci

SUMMARY

Subject : The Risk Levels of Metabolic Syndrome and Dietary Patterns Among Obese and Overweight Patients at Nutrition and Diet Clinic in a Private Hospital

Purpose : Metabolic syndrome is a disease consist of multiple cardiovascular disease that arise from genetic and environmental factors. The prevelance of metabolic syndrome in the world increased significantly in recent years. It affects mortality and morbidity. The study was conducted to investigate the metabolic syndrome risk levels and eating habits among individuals.

Method : : The sample of this cross sectional study consists of 70 adults above 18 years old (35 males and 35 females) who are being admitted to nutrition and diet clinic in private hospital between December 2014 and March 2015 and who are willing to participate in the research. The data were gathered using "Personal Information Questionnaire", "Food Frequency Consumption Questionnaire" and "Metabolic Syndrome Research Form".

Findings : According to the results of the study, the level of metabolic syndrome risk increases with increasing age and weight and decreases with increasing height. The volume of physical activity should be evaluated instead of frequency. Results show that snacks between meals may increase the risk level of metabolic syndrome. Foods with high glycemic index, industrial foods, legumes and dry fruits and low-fat dairy products was associated with metabolic syndrome risk levels.

Results : Medical dietary treatment is important to prevent chronic diseases which affect metabolic syndrome. Eating habits and metabolic syndrome risk levels should be examined more detailed in prospective studies.

Keywords : Metabolic syndrome, Eating habits, Obesity, Chronic diseases, Insulin resistance

1.INTRODUCTION AND OBJECTIVES

As a result of epidemic obesity, glucose and lipid metabolism disorder incidence is increasing in the world. Metabolic syndrome consists of different factors like genetic, enviromental factors and cardiovascular diseases. Metabolic syndrome is characterized by insulin and lipid metabolism disorder. Its incidence increased significantly in recent years with the result of increased mortality and morbidity.

In the United States National Heart, Lung and Blood Institute reported that approximetly 25% of the population in the United States have metabolic syndrome.

Metabolic syndrome's the most important feature is energy imbalances and changing metabolic roads. Abnormal metabolic reactions observed in metabolic syndrome cause increases in type 2 diabetes and cardiovascular disease. Lipocytes in adipose tissue leads the increase secretion of proinflamatory mediators and cause increases in insulin resistance. Insulin resistance may increase the risk of developing type 2 athoregenic dyslipidemia.

Total body weight is the indication of metabolic syndrome criteria. Especially visceral obesity and insulin resistance are primary pathogenes in metabolic syndrome. The prevelance of metabolic syndrome in normal weight is 5%, among overweight people is 22% and among obese people is 60%. The incidence in men and women is equal. Metabolic syndrome in overweight men 6 times more than normal weight men. It is 32 times more in obese patients. In women, overweight causes five fold increase metabolic syndrome and obesity causes 17 fold increase in metabolic syndrome.

Drug therapy and changing life styles in indivudals can be used for the management of metabolic syndrome. Increasing regular physical activity, ensuring weight loss, lowering blood pressure, normalize blood glucose levels, reducing dyslipidemia are treatment strategies of metabolic syndrome.

The aim in this study was to determine the risk factors for metabolic syndrome in overweight and obese individuals. For this purpose, the association between eating

habits and risk factors is determined eating habits creating medium risk, high and low risk are assessed and the effects of eating habits on the individuals are investigated. Thus, this study shows individuals with high risk level can become individuals with low risk by changing lifestyles, eating habits and physical activity. That is, diseases like chronic heart disease and diabetes can be prevented.

2.GENERAL INFORMATION

2.1.Metabolic Syndrome

Metabolic syndrome whose etiopathogenesis isn't known, is a collection of risk factors for diabetes mellitus and cardiovascular disease. In the world and in our country, about one third of the adult population has metabolic syndrome. Metabolic syndrome increases with age and it causes an increase in mortality and morbidity so it becomes a public health problem (1).

Metabolic syndrome prevelance is reported 22%. Its prevelance increases with age. Its prevelance is 6,7% age between 20-29 and 43,5% age between 60-69. According to TEKHARF study 9,2 million people (30 years and above) in Turkey, since 2000, has metabolic syndrome and 53% of individuals who developed cardiovascular disease also has metabolic syndrome. In our country metabolic syndrome prevelance is 28% in men and 40% in women.

Glucose and insulin metabolism disorders, obesity and especially abdominal obesity, the combination of several cardiovascular risk factors such as hypertension, dyslipidemia formed Syndrome x since 1988 (2). Many different names have been given time in this syndrome like "metabolic syndrome", "deadly quartet", "pluri metabolic syndrome", "insulin resistance syndrome", "dysmetabolic syndrome" (3).

In 1988, WHO has identified a number of criteria for the identification of metabolic syndrome. It based on OGTT. In this identification obesity included BMI or the ratio of waist and hip circumference. Microalbumin was also included in four criteria. National Cholesterol Education Program Expert Panel prepared high blood cholesterol detection, assesment and treatment report in adults in 2001 and proposes new criteria for metabolic syndrome (4).

Turkey Association of Endocrinology Metabolism, Metabolic Syndrome Working Group proposed Metabolic Syndrome Diagnostic Criteria in 2005 and it is still used (1).

Metabolic Syndrome Diagnostic Criteria

At least one of the following

- Diabetes mellitus
- Impaired glucose tolerance
- Insulin resistance (Homo-IR >2,7)

According to fasting plasma glucose
Fasting Plasma Glucose < 100 mg/dl = Normal
Fasting Plasma Glucose 100-125 mg/dl =Impaired plasma glucose
Fasting Plasma Glucose ≥126 mg / dL = Diabetes mellitus
According to OGTT
2 h. Plasma Glucose < 140 mg/dl = Normal
2 h. Plasma Glucose 140-149 mg/dl = Impaired Glucose Tolerance
2 h. Plasma Glucose ≥ 200 mg / dL = Diabetes mellitus

At least two of the following:

- Hypertension (systolic blood pressure> 130, diastolic blood pressure> 85 mmHg or antihypertensivewill be used)
- Dyslipidemia (triglyceride levels> 150 mg / dL, HDL levels in men or <40 mg / dL in women<50 mg / dl)
- Abdominal obesity (BMI> 30 kg / m2 or waist circumference: men> 94 cm in women> 80 cm)

The National Cholesterol Education Program's Adult Treatment Panel III Report (ATP III) identified the metabolic syndrome as multiplex risk factor.

Table 1. ATP III Clinical Identification Of Metabolic Syndrome

RISK FACTOR	**DEFINING LEVEL**
Abdominal obesity given as waist circumference	
Men	>102 cm
Women	>88 cm
Trigliycerides	≥1.7 mmol/L
HDL Cholesterol	
Men	<1.04 mmol/L
Women	<1.30 mmol/L
Blood Pressure	≥130/≥85 mm Hg
Fasting glucose	≥6.1 mmol/L

ATP III identified 6 components of metabolic syndrome

2.1.1. Abdominal obesity

2.1.2. Athorogenic dyslipidemia

2.1.3. Raised blood sugar

2.1.4. Insulin resistance

2.1.5. Proinflamatory state

2.1.6. Protrombotic state

2.1.1. Abdominal Obesity

Abdominal obesity is the form of obesity most strongly associated with the metabolic syndrome. It presents clinically as increased waist circumference (5). The prevalence of abdominal obesity is increasing in western populations, due to a combination of low physical activity and high-energy diets, and also in developing countries, where it is associated with the urbanization of populations (6).

2.1.2. Athorogenic Dyslipidemia

Atherogenic dyslipidemia, a component of metabolic syndrome, is characterized by high levels of apolipoprotein B (apo B)-containing lipoproteins, including very-low-density lipoprotein remnants and small low-density lipoprotein particles, and reduced levels of high-density lipoprotein cholesterol (7). An important component of atherogenic dyslipidemia is abdominal obesity, which is defined as increased waist circumference and has recently been identified as a chief predictor of the metabolic syndrome in certain patients (8).

2.1.3. Raised Blood Pressure

High blood pressure is important component of metabolic syndrome. It is associated with insulin resistance and visceral obesity (9). Insulin resistance and the resulting hyperinsulinemia induce blood pressure elevation by the activation of sympathetic nervous system and renin-angiotensin-aldosterone system (RAAS) with consequential sodium retention and alteration in renal function. One of the proposed mechanisms by which hypertension is linked with abdominal obesity includes sympathetic nervous system over activation. It has been reported that the metabolic syndrome is present in up to one third of hypertensive patients (10,11). It causes to increase cardiovascular mortality and morbidity (12).

2.1.4. Insulin Resistance

Patients with insulin resistance have hyperinsulinemia together with normoglycemia or hyperglycemia. Insulin resistance is present in the majority of people with metabolic syndrome. It is associated with obesity, non-insulin dependent diabetes mellitus and hypertension (13).

2.1.5. Proinflamatory State

It is suggested that chronic-mild inflammation creates an important factor of metabolic syndrome. In obesity synthesis and release of pro-inflamatory adipokines

(TNF-α, IL-6, PAI-1,haptoglobin and leptin) is increased while protective adipokinectin decrease (14).

C-reactive protein (CRP) is an inflammatory marker which is demonstrated as a strong predictor of future cardiovascular events. Obesity and excess adipose tissue releases inflamatory cytokines and cause in increase in CRP levels (15). Also it is suggested that insulin resistance can lead to increase in CRP levels so it was demonstrated that CRP levels are increased with the number of components of metabolic syndrome. The more components of metabolic syndrome, the higher CRP levels obtained (14). There are several studies that compare CRP levels with insulin resistance, obesity and fasting glucose levels and waist circumference.

2.1.6. Prothrombotic State

Protrombotic state is considered to be one of the components of metabolic syndrome and takes part in the development of atherotrombotic complications. The dysregulation of haemostasis in metabolic syndrome involves endothelial dysfunction platelet hyperactivity, hypercoagulability and hypofibrinolysis (16). The risk of thromboembolism is increased in abdominal obesity the result from changes of coagulation system. This is occur by increased the generation of thrombin, (which converts fibrinogen to fibrin) hypofibrinolysis (diminished fibrinolysis) and increased platelet aggregation. Increased levels of fibrinogen, factor VII and VIII lead to hypercoagulability which is characteristic of metabolic syndrome. Pro- inflamatory state is also associated with increased levels of coagulation factors. There are few studies investigate the association with body fat and procoagulant factors and anticoagulant proteins. Godsland et al have found that procoagulant factors factors VII and X, anticoagulant proteins C and S and PAI-1 (plasminogen activator inhibitor) correlated directly with total and abdominal body fat (17). In addition there is also strong relationship with insulin resistance and prothrombotic status. Hyperinsulinemia induces the production of PAI-1 (plasminogen activator inhibitor) and hepatic fibrinogen which have role in atherogenesis (18).

2.2. Metabolic Syndrome and Obesity

Obesity is defined as excessive accumulation of body fat, including total body fat, a particular fat deposits and even morphology of adipocites. Obesity is becoming worldwide epidemic contributing to increased morbidity and mortality. Obesity is a multifactorial disease caused mainly by the interaction of genetic and environmental factors. The increase in body fat deposits generally coincides with an increase in body weight, leading to a greater risk of comorbidities and affecting both quality of life and life expectancy. The prevelance of overweight (BMI 25,0 to 29,9) and obesity (BMI 30,0 and above) is approximetly 66,6% in United States (19). Obesity is more common in women, and overweight is more common in men. Obesity is a risk factor for major causes of death, including cardiovascular disease, numerous cancers, and diabetes, and is linked with markedly diminished life expectancy (20).

The number of fat cells can be estimated from the total amount of body fat and the average size of a fat cell. Hypertrophic obesity (obesity with enlarged fat cell but not an increased number of fat cells) tends to correlate with an android or truncal fat distribution and often is associated with metabolic disorders such as glucose intolerance, dyslipidemia, hypertension, and coronary artery disease. Hypercellular obesity (obesity with an increased number of fat cells) shows varying degrees of enlargement of fat cells (21).

Obesity diagnosed by several anthropometric techniques like BMI, waist to hip ratio, skinfold measurement. Although BMI has been accepted by the scientific community because of its simplicity and its established relationship with the mortality risk, it is important highlight that BMI does not distinguish between being overweight due to lean mass or due to fat accumulation. The midpoint measure of waist circumference should be used to diagnose abdominal obesity and so it is used as one of the five criteria for metabolic syndrome diagnosis (22).Waist circumference 94 cm above in men and 80 cm above in women are at risk in metabolic syndrome.

Long-term studies showed that obesity led to clustering of cardiovascular risk factors or metabolic syndrome (23). Obesity especially abdomino-visceral, is associated with certain pathogenic factors like high plasma levels of free fatty acids, increased hepatic glycogenesis, and peripheral insulin resistance. In obesity there is chronic inflammatory state mediated by cytokines released by adipose tissue such as TNF alfa, interleukin-6, plasminogen activator inhibitor, C reactive protein and resistance. Lipid storage and weight increase require anabolic processes, while inflammation stimulates catabolism such as lipolysis. As a consequences of lipolysis there is a release of free fatty acids. They are transported directly to the liver. Increased free fatty acid, together with inflammatory cytokines trigger a decrease in insulin sensitivity in tissues that depend on insulin (24). Bergmen et al have showed that overfeeding causes enlargement of the visceral fat depots with insulin resistance. Increases in overfeeding causes visceral and subcutaneous fat cells enlarge and becomes insulin resistance more severe. Extra stored fat increases the size of fat cells and raises circulating fatty acids. Exposure to increased levels of free fatty acids can also itself produce insulin resistance, which is characteristic of the metabolic syndrome (21).

2.3. Metabolic Syndrome and Insulin Resistance

Insulin is a hormone necessary for the normal metabolism and provision of energy from carbonhydrate, fat, and protein molecules. Insulin facilitates the uptake and metabolism of glucose in peripheral muscle, fat and hepatic tissue. Insulin resistance is a state that impaired physiologic response to the normal actions of insulin. Abdominal obesity, physical inactivity and genetic factors contribute to the onset or development of insulin resistance. Main pathophysiology of hypertension, obesity, glucose intolerance, dyslipidemia is insulin resistance. It affected 25% of the society and genes are the most important factor for transmission (25).

Increase in adipose tissue and insulin resistance plays an important role in type 2 dm pathogenesis. In insulin resistance, lipoprotein lipase activity is decreasing while plasma triglyceride levels are increased and LPL activity in the liver increases and destruction of HDL increases. One of the characteristics of the insulin resistance is the

increased plasma free fatty acid concentration. Free fatty acids stimulate the accumulation of triglycerides in the liver (26). Depending on increasing of free fatty acid levels increase in CRP levels and TNF levels can be seen (27).

Metabolic syndrome is relevant about post reseptor insulin levels. This is the resistance which come up after binding the reseptor formed by disturbances in intracellular pathways (28).

Primary factor of the development of type 2 diabetes is the development of insulin resistance in tissues. Then hyperglicemia appears. According to the differences in insulin sensitivity in tissues, when insulin sensitivity starts glucose degredation decrease in muscles first. This leads to postprandial hyperglycemia. This is followed by more pronounced insulin ineffectiveness and increase hepatic glucose output. So, fasting hyperglycemia and hyperglycemia that lasts all day appears (29).

Adiponectin is a plasma protein secreted by the adipose tissue. Adiponectin simplifies clearance of free fatty acids, plasma glucose and triglycerides and suppresses hepatic glucose production. It also accumalates damaged blood vessel walls and prevents the negative effects of important proinflammatory mediators in the process of atherogenesis. Adiponectin levels are decreased in obese individuals. Adiponectin level regulation is more in visceral tissue than subcutanous tissue. It is compatible with the impart of visceral adiposity and insulin resistance in connection with metabolic syndrome (26).

Insulin resistance is not always in people with elevated blood glucose. Even sometimes symptoms of hypoglycemia primary and sole. After making oral glucose tolerance test there can be hyperglicemia within 2 hours and then hypoglicemia. Such patients are often faced with a progressive weight gain (28).

Body fat distribution is an important factor for insulin resistance. According to study in 1956, android type obesity is more relevant about coroner arter disease and diabetes than gynoid type obesity. In a study conducted among obese children aged 5-16 years, significant correlation found between plasma insulin, insulin resistance and

waist circumference. The connection between visceral obesity and insulin is due to the metabolic properties of the deposited fat tissues properties in omental adipose tissue (30).

Safe pharmaceutical agents can be used in treatment of insulin resistance treatment. There are also studies about the benefits of exercise in the breaking of insulin resistance. In a study done by Thorell and friends has been show that exercise increase glucose transport in skeletal muscle (31). Diet is very important as well as exercise and pharmacologicagents. Increase fat and decreasing calories in diet shows increase insulin resistance in studies (32). Low glisemic index diets are also recommended for insulin resistance.

2.4. Metabolic Syndrome and Cardiovascular Disease

Coronary artery disease and cerebrovascular diseases are the leading causes of death in adults (33). Several recent reports shows that presence of metabolic syndrome is associated with increased risk for atherosclerotic cardiovascular disease. Persons with metabolic syndrome have at least 2 fold increase in risk for atherosclerotic cardiovascular disease compared with those without (34). The National Cholesterol Education Program for metabolic syndrome (NCEP) and revised NCEP definitions that use the 87 clinical trials and 951,083 patients were included in a meta-analysis. This meta analysis has been shown metabolic syndrome induced the risk of cardiovascular disease 2.35, cardiovascular mortality 2.40, all induced mortality 1.58, risk of myocardial infarction 1.99 and stroke 2.27 fold. (35). Mechanisms of atherosclerotic cardiovascular disease are atherogenic dyslipidemia, elevated blood pressure, prothrombotic state and proinflamatory state.

Increased fat in the liver provides a stimulus for increase formation and secretion of VLDL particles. It results with higher serum levels of triglyceride, apo B and small LDL particles and promotes development of athorogenic dyslipidemia in obese patients (36). Obesity also reduces HDL levels (37). Low HDL levels another characteristic of athorogenic dyslipidemia (4).

Obese patients have higher prevelance of elevated blood pressure than lean persons. Moreover higher blood pressure is strong risk factor for cardiovascular disease (38).

Obesity is accompanied by large number of coagulation and fibrinolytic abnormalities (39). This suggest that obesity cause increase a prothrombotic state. In obese patient particularly who have matabolic syndrome also have higher CRP levels. This findings has suggested that obesity is proinflmatory state and associate with the unstable atherosclorotic plaques (40).

2.5. Management with Metabolic Syndrome

The treatment of the metabolic syndrome aims to improve insulin sensitivity and prevent associated metabolic and cardiovascular abnormalities. Drug therapy can begin in necessary conditions in metabolic syndrome. The most appropriate treatment is weight reduction, increase physical activity, healthy eating and smoking cessation (1).

The long term of therapy is dietary treatment and weight reduction. The first aim of weight loss is to achieve a decline about 7% to 10% from baseline total body weight during a period of 6 to 12 months. This will require decreasing calorie intake by 500 to 1000 calories per day (41). Such diets like low calorie diets and high fat/low carbohydrate diets are seldom effective in long term weight reduction. ATP III recommendations for diet composition for patients with metabolic syndrome are consistent with general dietary recommendations. This guidelines suggest to decrease intake of saturated fat, trans fat, cholesterol, simple sugar and increase intake of fruits, vegetables and whole grains (41). Very high carbohydrate intakes can intensify dyslipidemia of the metabolic syndrome. Human studies attempted to evaluate relationship between total fat intake and insulin sensitivity. Fat intake is correlated with both plasma insulin values (positively) and insulin sensitivity (negatively) (42). ATP III recommended that for indivudals entering cholesterol management the diet should contain 25% to 35% of caloires as total fat (40). The diet for treatment of the metabolic syndrome should be limited in the intake of saturated fat, for its known unfavourable effects on insulin sensitivity and blood pressure, as well as on plasma lipids. Moderate

amounts of monounsaturated fat could be permitted since they do not induce detrimental metabolic effects. Carbohydrate-rich foods especially high GI foods also restricted for their unfavourable effects on metabolic abnormalities and cardiovascular risk factors (42).

Physical inactivity must be considered as important factor of metabolic syndrome. Regular exercise and fitness have been shown to improve several metabolic risk factors and are associated with a reduction in the risk of developing many chronic diseases (40). Regular pyhsical activity improve insulin resistance, glucose, lipid and blood pressure and improves cardiovascular function (1). Current recommendations for the public call for accumalation of >30 minutes of moderate-intensity exercise, such as brisk walking, on most, and preferably all, days of week. Sixty minutes or more of continuous or intermittent aerobic activity, done every day, will promote weight loss or weight loss maintanence. For cardiovascular risk reduction authorities recommended to walk 10.000 steps every day (40).

For prevention of diabetes and insulin resistance some drugs should be used. First step in treatment of insulin resistance in patients with diabetus mellitus is to choose drugs that reduce insulin resistance. Metformin therapy in patients with prediabetes will prevent or delay the development of diabetes (41). Data on use of the thiazolidinedione troglitazone suggested a similar effect, but this drug has been withdrawn from commercial use. There has been no confirmation yet for the use of metformin and glizatones in patients with non diabetics (1). Various drugs can also used for hipertansion and dyslipidemia.

3. MATERIALS AND METHODS

Thirty five obese and overweight woman and thirty five obese and overweight man who applied to private hospital nutrition and diet clinic between November 2015 and January 2016 were taken to study. This study consist of 70 adults above 18 years old. 2 people were excluded from the study because of study criteria. Ethical committee and written consent from participants were taken for conducting study. The data were gathered using "Personal Information Questionnaire", " Metabolic Syndrome Research Form", "Food Frequency Questionnaire".

Personal Information Questionnaire: Individuals gender, age, education status, work status, socio -demographic characteristics which contains 18 questions.

Metabolic Syndrome Research Form: This form is prepared by Dr. Onur Erdoğmuş. Validity and reliability studies have been made. Permission to use the form is taken from Dr. Onur Erdoğmuş. This form consists of 14 questions about patients eating habits, exercise level, blood pressure, weight status. This form has been used few studies in our country (The Risk Levels of Metabolic Syndrome and Related Factors among Adults Admitted at a Village Clinic, 2010). The survey is scored between 0-14. Between 0-4 points are considered low risk, between 5-8 points are considered middle risk and between 9-14 points are considered high risk

Food Frequency Questionnaire: This form consists of different foods to learn the consumption of food frequencies. The most widely consumed foods were chosen from all food groups. The freqency table categorized by everyday, 3 or 5 times in a week, 1 or 2 times in a week, once in a 15 days and never.

The data obtained from the sudy is analyzed by using SPSS (version 20) software program.

4. RESULTS

Table 2. Age and Anthropometric Measurements of the Participants

	n	Mean	Min	Max	Median	Mode	St Deviation
Age	68	45,15	19,00	78,00	45,50	39,00	12,76
Height	68	168,57	150,00	194,00	168,00	160,00	9,39
Weight	68	86,60	65,00	121,20	85,00	80,00	12,81

Average age of the respondents is 45,15∓12,76. The youngest respondent is 19 and the oldest one is 78 years old.

Average height of respondents is 168,57∓9,39 cm. The tallest respondent is 194 cm tall and the shortest one is 150 cm tall.

Average weight of respondents is 86,60∓12,81 kg. The fattest respondent is 121,20 kg and the thinnest one is 65 kg.

Table 3. General Features of the Participants

		N	Mean	Min	Max	Median	Mode	St Deviation	%
Gender	Female	35							51,5
	Male	33							48,5
Marital status	Married	55							83,3
	Single	11							16,7
Education	Illiterate	0							0,0
	Literate	4							5,9
	Middle School	10							14,7
	High School	25							36,8
	University	29							42,6

Average weight of respondents is 86,60∓12,81 kg. The fattest respondent is 121,20 kg and the thinnest one is 65 kg.

According to gender distribution, 51,5% of them are female and 48,5% of them are male.

There is no illiterate person in the sample. Out of 5,9% of all respondents are literate, 14,7% are graduated from middle school, 36,8% are graduated from high school and 42,6% are graduated from university.

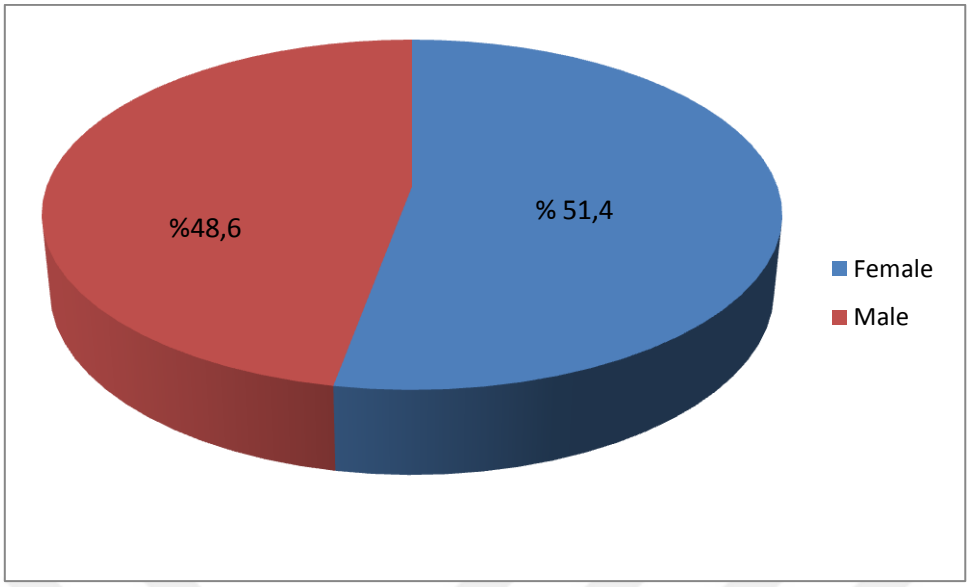

Figure 1. Gender Distribution of the Population

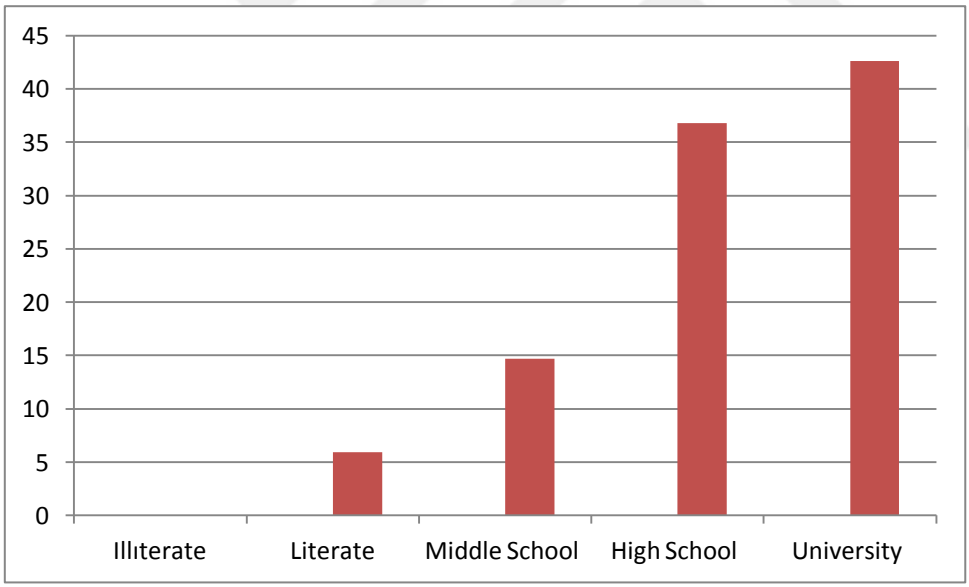

Figure 2. The Distribution of Educational Level

Table 4. General Features According To Metabolic Syndrome Levels

		MS								
		Low			Middle			High		
		n	Row N %	Column N %	n	Row N %	Column N %	n	Row N %	Column N %
Gender	Female	5	16,7	50,0	18	50,0	51,4	12	33,3	57,1
	Male	6	18,8	50,0	17	53,1	48,6	10	28,1	42,9
Education	Illiterate	0	0,0	0,0	0	0,0	0,0	0	0,0	0,0
	Literate	0	0,0	0,0	3	75,0	8,6	1	25,0	4,8
	Middle School	3	30,0	25,0	5	50,0	14,3	2	20,0	9,5
	High School	4	16,0	33,3	14	56,0	40,0	7	28,0	33,3
	University	5	17,2	41,7	13	44,8	37,1	11	37,9	52,4

Gender distribution according to MS levels showed that 16,7% of females are in low, 50% of them are in middle and 33,3% of them are in high risk profile. Similarly 18,8% of males are in low, 53,1% of them are in middle and 28,1% of them are in high risk profile. Low level MS group distributed equally among males and females. Both middle and high level MS groups consist of more females than males.

Considering educational level distribution according to MS levels showed that none of literate ones are in low, 75% of them are in middle and 25% of them are in high risk profile. 30% of middle school graduated ones are in low, 50% of them are in middle and 20% of them are in high risk profile. 16% of high school graduated ones are in low, 56% of them are in middle and 28% of them are in high risk profile. 17,2% of university graduated are in low, 44,8% of them are in middle and 37,9% of them are in high risk profile. While low and high level MS groups consist of more university graduated respondents than others, more high school graduated ones than others are found in middle level MS group.

Table 5. Age and Anthropometric Measurements According to Metabolic Syndrome Levels

	MS														
	Low					Middle					High				
	n	Mean	Min	Max	St Deviation	n	Mean	Min	Max	St Deviation	n	Mean	Min	Max	St Deviation
Age	12	40,9	21,0	63,0	12,9	35	44,1	19,0	78,0	13,8	21	49,4	37,0	72,0	9,8
Height	12	169,3	158	185	8,8	35	169,3	150	194	9,8	21	167,0	151,0	185,0	9,2
Weight	12	83,7	68,7	120	13,9	35	86,5	65,0	109,2	12,1	21	88,4	68,0	121,2	13,6

Age distribution according to MS levels showed that risk level increase with age. Older respondents have more MS risk than others but there is no statistically significant difference according to age among MS levels of patient (p=0,144). Same as age, weight distribution according to MS levels showed that risk level increase with weight but there is no statistically significant difference according to weight among MS levels of patients (p=0,601). On the contrary risk level decreases when height increases but there is no statisticaly significant difference according to height among MS levels of patients (p=0,676).

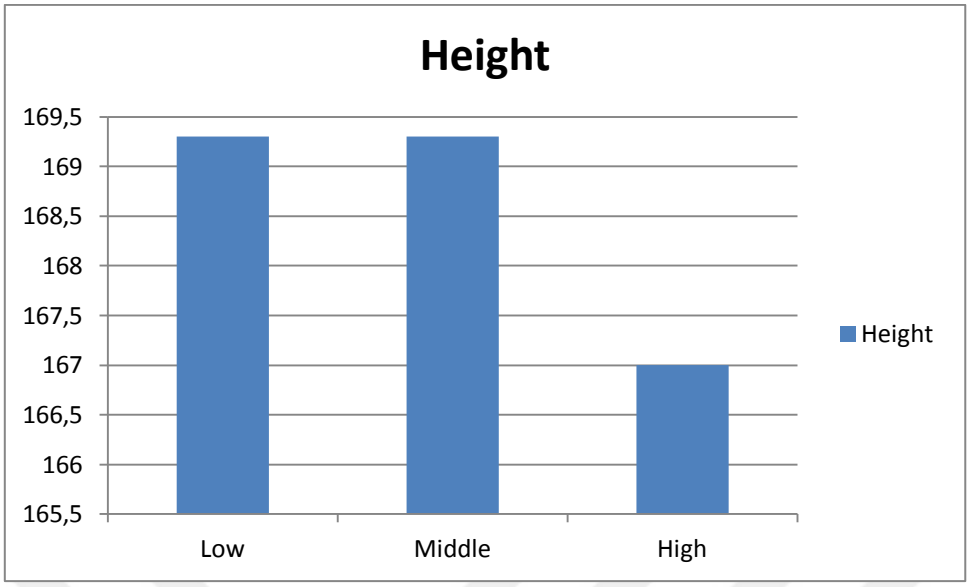

Figure 3. Height Distribution Among Risk Levels

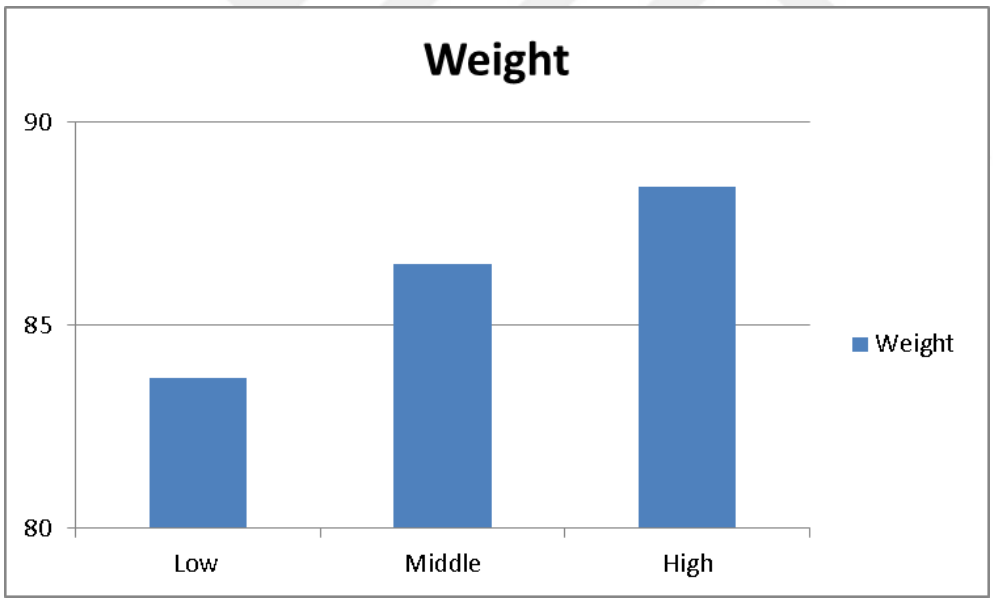

Figure 4. Weight Distribution Among Risk Levels

Table 6. Body Mass Index Levels According to Metabolic Syndrome Levels

Factor	MS Levels (mean)			F	Sig.
	Low	Middle	High		
BMI	29,15	29,31	31,79	1,538	0,223

There is no statistically significant difference according to BMI among MS levels of patients. But metabolic syndrome levels showed that risk level increase with body mass index.

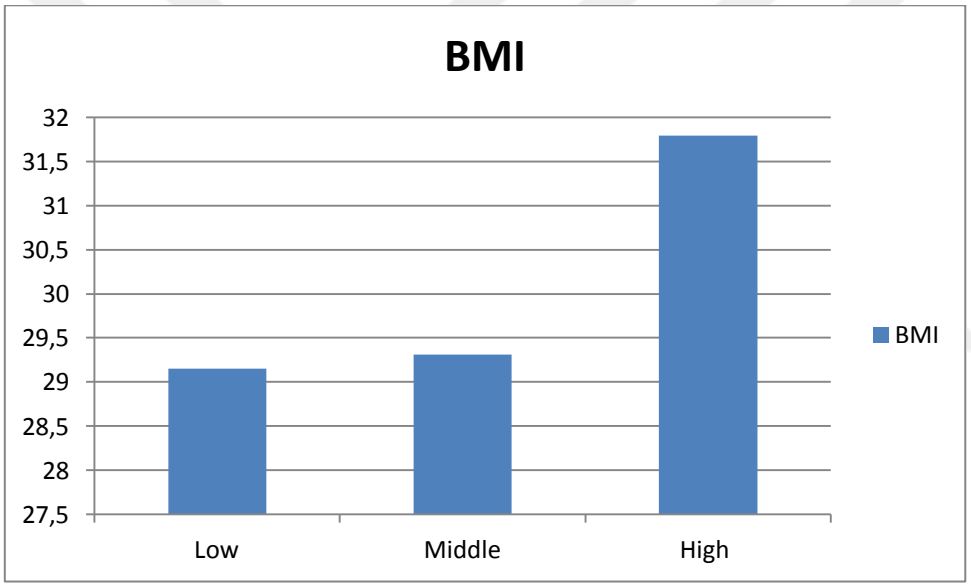

Figure 5. BMI Distribution Among Risk Levels

Table 7. Distribution of Metabolic Syndrome Risk Levels

		n	%
MS	Low	12	17,6
	Middle	35	51,5
	High	21	30,9

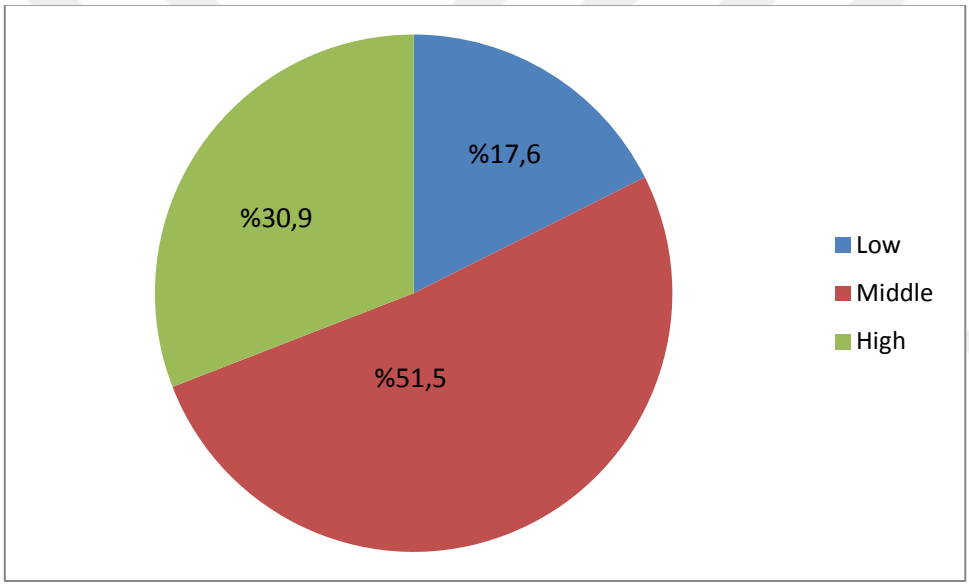

Figure 6. Distribution of Metabolic Syndrome Risk Levels Among Respondents

Table 8. Health Status of the Participants

		n	%
Disease	Yes	32	47,8
	No	35	52,2
Disease name	Hypertension	13	40,6
	Hypothyroidism	3	9,4
	Diabetes	6	18,8
	Hyperlipidemia	1	3,1
	Reflux	2	6,3
	Hashimotos thyroiditis	2	6,3
	Other[1]	9	28,1
Regular medication	Yes	26	42,6
	No	35	57,4

32 respondents (47,8%) stated that they have at least one diagnosed disease. 81,25% of them (26 people) claimed to use regular medication.

According to distribution of diseases, the most common ones are hypertension (40,6%) and diabetes (18,8%).

Other diseases: Heart condition, insulin resistance, lenfoma, migraine, coronary artery, fatty liver and hypoglycemia

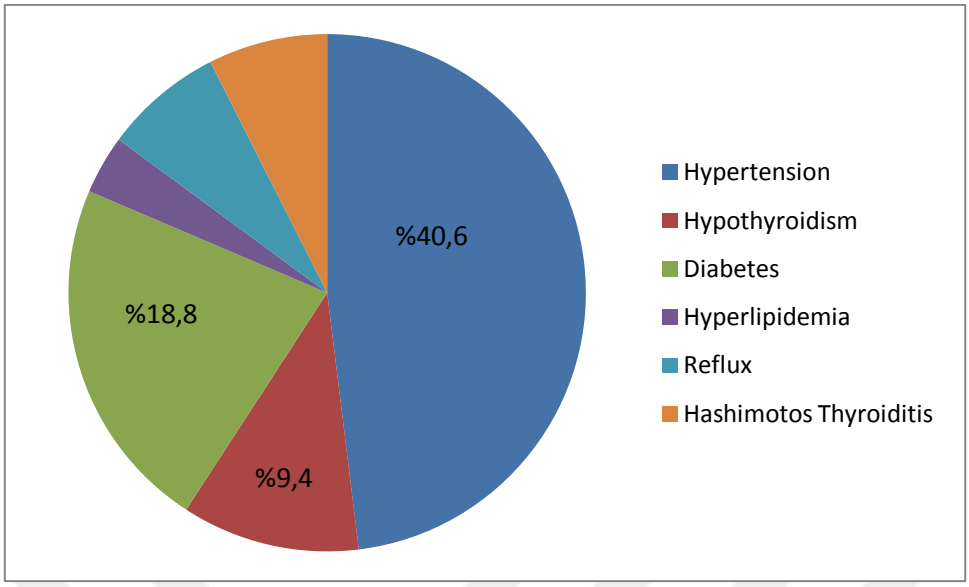

Figure 7. Disease Distribution of the Respondents

Table 9 . Health Status of the Participants According to Metabolic Syndrome

		MS								
		Low			Middle			High		
		n	Column N %	Row N %	n	Column N %	Row N %	n	Column N %	Row N %
Disease	Yes	2	16,7	6,3	14	41,2	43,8	16	76,2	50,0
	No	10	83,3	28,6	20	58,8	57,1	5	23,8	14,3
Disease name	Hypertension	0	0,0	0,0	5	31,3	38,5	8	42,1	61,5
	Hypothyroidism	0	0,0	0,0	2	12,5	40,0	3	15,8	60,0
	Diabetes	0	0,0	0,0	1	6,3	16,7	5	26,3	83,3
	Hyperlipidemia	0	0,0	0,0	1	6,3	100,0	0	0,0	0,0
	Reflux	0	0,0	0,0	0	0,0	0,0	2	10,5	100,0
	Hashimotos thyroiditis	0	0,0	0,0	2	12,5	100,0	0	0,0	0,0
	Other	2	100,0	25,0	5	31,3	62,5	1	5,3	12,5
Regular medication	Yes	2	16,7	7,7	12	41,4	46,2	12	60,0	46,2
	No	10	83,3	28,6	17	58,6	48,6	8	40,0	22,9

Disease condition according to MS levels showed that disease increases the MS risk level. In high level group 76,2% of patients have at least one diagnosed disease. Hypertension, hypothyroidism and diabetes are the most common diseases in the high risk group. Medication usage increases with risk level as expecteted.

Table 10 . Statistical Differences Between Risk Groups According to Disease

Disease	MS Levels (count)			F	Sig.
	Low	Middle	High		
Yes	2	14	16	7,013	0,002
	b	***b***	***a***		
No	10	20	5		
	a	***a***	***b***		

Patients who has any disease have higher frequency in high level risk group rather than low and middle risk group.

Table 11. Smoking and Alcohol Consumption of the Participants

		n	%
Smoke	Yes	14	24,6
	No	43	75,4
Alcohol	Yes	21	30,9
	No	47	69,1

24,6% of respondents state themselves as regular smoker and 30,9% of them as using alcohol

Table 12. Physical Activity of the Participants

Exercise	Yes	23	33,8
	No	45	66,2
Frequency	Once a week	5	21,7
	Twice a week	7	30,4
	Everyday	2	8,7
	Three times a week and more	9	39,1
Time	Less than 30 min	3	14,3
	At least 30 min	6	28,6
	At least 45 min	7	33,3
	At least 60 min	4	19,0
	1 hour and more	1	4,8

39,1% of the respondents doing three times a week and more and 28,6% of them claimed that doing exercise at least 30 minutes.

Table 13. Smoking and Alcohol Consumption According to Metabolic Syndrome Levels.

		MS								
		Low			Middle			High		
		n	Column N %	Row N %	n	Column N %	Row N %	n	Column N %	Row N %
Smoke	Yes	2	22,2	14,3	8	27,6	57,1	4	21,1	28,6
	No	7	77,8	16,3	21	72,4	48,8	15	78,9	34,9
Alcohol	Yes	4	33,3	19,0	9	25,7	42,9	8	38,1	38,1
	No	8	66,7	17,0	26	74,3	55,3	13	61,9	27,7

14,3% of smokers in low, 57,1% in middle and 21,1% in high level risk group. 78,9% of high risk group are non-smoker.

Most of alcohol users (42,9%) are in middle level risk group. Only %38,1 of high risk group use alcohol. There is no statistical significance between smoking and metabolic syndrome (p=0,869) and between alcohol drinking and metabolic syndrome (p=0,623)

Table 14. Physical Activity According to Metabolic Syndrome Levels.

		MS								
		Low			Middle			High		
		n	Column N %	Row N %	n	Column N %	Row N %	n	Column N %	Row N %
Exercise	Yes	7	58,3	30,4	12	34,3	52,2	4	19,0	17,4
	No	5	41,7	11,1	23	65,7	51,1	17	81,0	37,8
Frequency	Once a week	1	14,3	20,0	3	25,0	60,0	1	25,0	20,0
	Twice a week	2	28,6	28,6	3	25,0	42,9	2	50,0	28,6
	Everyday	1	14,3	50,0	1	8,3	50,0	0	0,0	0,0
	Never	0	0,0	0,0	0	0,0	0,0	0	0,0	0,0
	Three times a week and more	3	42,9	33,3	5	41,7	55,6	1	25,0	11,1
Time	Less than 30 min	1	16,7	33,3	2	18,2	66,7	0	0,0	0,0
	At least 30 min	2	33,3	33,3	4	36,4	66,7	0	0,0	0,0
	At least 45 min	1	16,7	14,3	4	36,4	57,1	2	50,0	28,6
	At least 60 min	2	33,3	50,0	1	9,1	25,0	1	25,0	25,0
	1 hour and more	0	0,0	0,0	0	0,0	0,0	1	25,0	100,0

In high risk group, 81% of respondents stated that not doing exercise. On the other hand 58,3% of low risk group are exercisers and 17,4% of exercisers are in high risk level group.

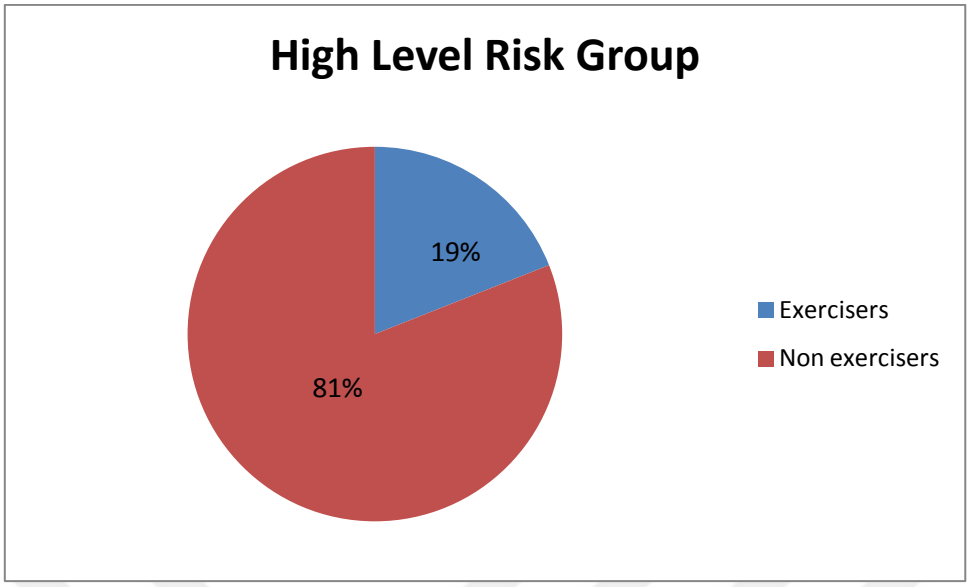

Figure 8. Exercise Distribution Among High Risk Group

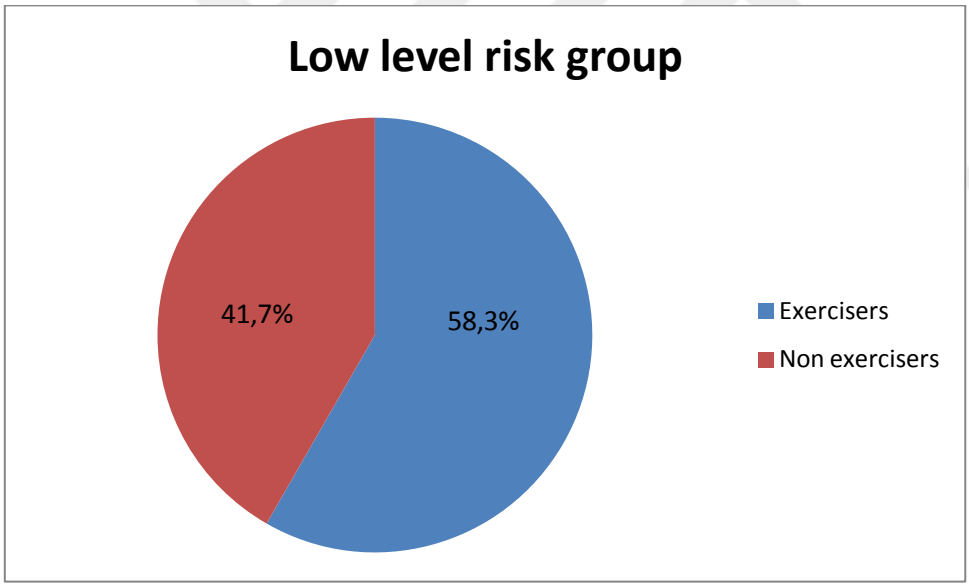

Figure 9. Exercise Distribution Among Low Level Risk Group

Table 15. Correlation Analysis Between Exercise Frequency and Metabolic Syndrome

		Exercise frequency	MS
Exercisf requenc y	Pearson Correlation	1	0,275*
	Sig. (2-tailed)		0,023
	N	68	68
MS	Pearson Correlation	0,275*	1
	Sig. (2-tailed)	0,023	
	N	68	68

* Significant at alpha: 0,05 level

Exercise frequencies were asked to participants. Their answers codded as;

Every day: 7

3 times a week and more: 3

Twice a week: 2

Once a week: 1

Never: 0

Further calculations will be explicated according to these frequency degrees.

According to correlation analysis there is a positive and statistically significant relationship between exercise frequency and MS level. Which means, exercise frequency is higher with MS level. In other word, increase in frequency of physical activity leads to increase in risk levels.

Table 16. Chi-Square Test Between MS Levels and Exercise Habits

		MS LEVELS						
		Low		Middle		High		χ^2
		n	%	n	%	n	%	
Exercise	Yes	7	58,3	12	34,3	4	19	χ^2:5,27 p:0,072
	No	5	41,7	23	65,7	17	81	

According to χ^2test, there is no statistically significant relationship between MS levels exercise habits.

Table 17. Chi-Square Test Between MS Levels and Time of Exercise

		MS LEVELS						
		Low		Middle		High		χ^2
		n	%	n	%	n	%	
Time	Less than 30 min	1	16,7	2	18,2	0	0	χ^2:8,54 p:0,383
	At least 30 min	2	33,3	4	36,4	0	0	
	At least 45 min	1	16,7	4	36,4	2	50	
	At least 60 min	2	33,3	1	9,1	1	25	
	1 hour and more	0	0	0	0	1	25	

According to χ^2test, there is no statistically significant relationship between MS levels and time of respondents.

Table 18. Meal Consumption of the Participants

		n	%
Main meal	1	0	0,0
	2	25	36,8
	3	42	61,8
	None	1	1,5
Snack	1	26	38,2
	2	12	17,6
	3	3	4,4
	None	27	39,7
Meal skipping	Yes	37	54,4
	No	31	45,6
Skipped meal	Breakfast	6	16,2
	Lunch	25	67,6
	Dinner	6	16,2

It is asked that "how many main meals and snacks do you eat in a day" to participants. 61,8% of them responded that they eat 3 main meals and 38,2% eats just one snack in a day. 39,7% of respondents mentioned that they never eat any snack. 54,4% of respondents claimed that they skip meals. The most skipped meal is lunch (67,6%).

Table 19. Meal Consumption According to Metabolic Syndrome

		MS								
		Low			Middle			High		
		n	Column N %	Row N %	n	Column N %	Row N %	n	Column N %	Row N %
Main meal	1	0	0,0	0,0	0	0,0	0,0	0	0,0	0,0
	2	4	33,3	16,0	17	48,6	68,0	4	19,0	16,0
	3	8	66,7	19,0	17	48,6	40,5	17	81,0	40,5
	None	0	0,0	0,0	1	2,9	100,0	0	0,0	0,0
Snack	1	4	33,3	15,4	14	40,0	53,8	8	38,1	30,8
	2	4	33,3	33,3	6	17,1	50,0	2	9,5	16,7
	3	1	8,3	33,3	0	0,0	0,0	2	9,5	66,7
	None	3	25,0	11,1	15	42,9	55,6	9	42,9	33,3
Meal skipping	Yes	5	41,7	13,5	22	62,9	59,5	10	47,6	27,0
	No	7	58,3	22,6	13	37,1	41,9	11	52,4	35,5
Skipped meal	Breakfast	0	0,0	0,0	2	9,1	33,3	4	40,0	66,7
	Lunch	4	80,0	16,0	15	68,2	60,0	6	60,0	24,0
	Dinner	1	20,0	16,7	5	22,7	83,3	0	0,0	0,0

66,7% of low risk level group, 48,6% of middle risk group and 81% of high risk group eat 3 main meals each day. Most respondents (81%) who eat 3 main meals are in middle and high risk group.

42,9% of respondents that belong to high risk level group mentioned not to have any snack in daytime. This rate is the same for middle risk level group. Most respondents (66,7%) who claimed to eat snacks 3 times each day are in high risk level group.

47,6% of high level risk group stated that they skip meals, mostly lunch. Most meal skippers (59,5%) belongs to middle risk level group. However, most breakfast skippers are at high risk level.

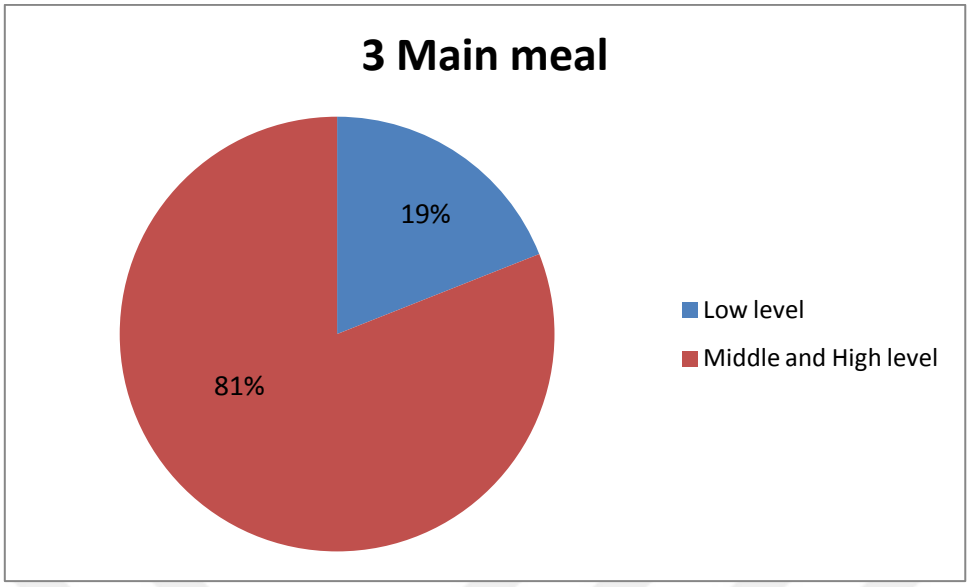

Figure 10. Main Meal Distribution Among Risk Groups

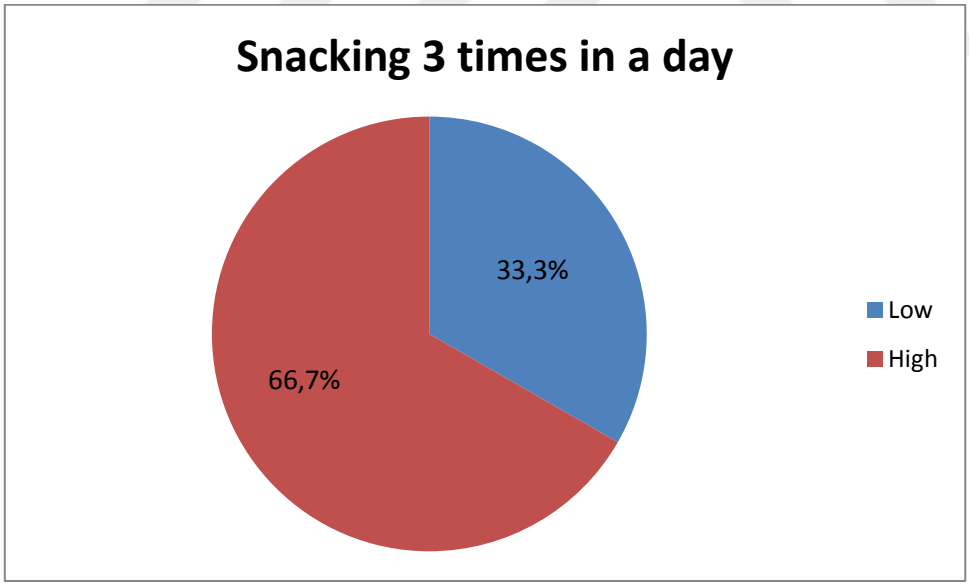

Figure 11. Distribution of 3 Times Snacking In a Day Among Risk Groups

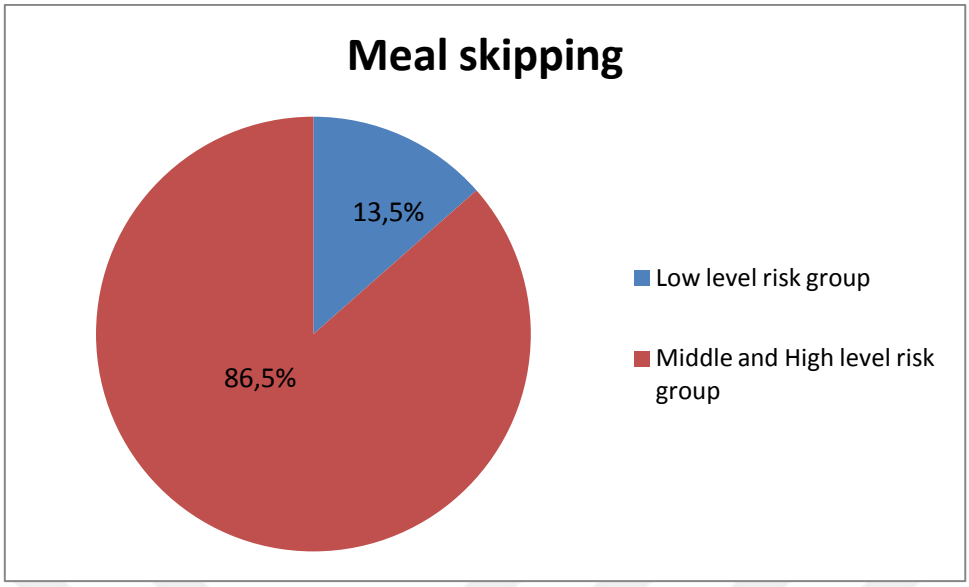

Figure 12. Meal Skipping Distribution Among Risk Groups

Table 20. Consumption Frequency In Means of Total Group and Metabolic Syndrome Risk.

ANOVA

		Sum of squares	df	Mean square	F	Sig
Fish	Between groups	4,183	2	2,091	1,589	0,212
	Within Groups	85,534	65	1,316		
	Total Groups	89,717	67			
Meat products	Between Groups	6,078	2	3,039	1,811	0,172
	Within Groups	109,105	65	1,679		
	Total Groups	115,184	67			
Egg	Between groups	1,327	2	0,663	0,136	0,873
	Within Groups	316,920	65	4,876		
	Total Groups	318,246	67			
Offal	Between Groups	0,720	2	0,360	1,927	0,154
	Within groups	11,777	63	0,187		
	Total Groups	12,497	65			
Proccessed meat	Between Groups	1,946	2	0,973	0,828	0,442
	Within groups	76,425	65	1,176		
	Total Groups	78,371	67			
Olive Oil	Between Groups	27,213	2	13,607	2,298	0,109
	Within Groups	384,879	65	5,921		
	Total Groups	412,092	67			
Sunflower Oil	Between Groups	4,891	2	2,446	0,252	0,778
	Within Groups	621,928	64	9,718		
	Total Groups	626,819	66			
Corn Oil	Between Groups	22,525	2	11,263	2,009	0,143
	Within Groups	353,256	63	5,607		
	Total Groups	375,781	65			
Tail Fat	Between Groups	0,112	2	0,056	1,227	0,300
	Within Groups	2,931	64	0,046		
	Total Groups	3,043	66			
Butter	Between Groups	12,049	2	6,024	0,630	0,536
	Within Groups	621,689	65	9,564		
	Total Groups	633,738	67			
Margarine	Between Groups	1,658	2	0,829	0,512	0,602
	Within Groups	105,210	65	1,619		
	Total Groups	106,868	67			
Skimmed Dairy Porducts	Between Groups	2,626	2	1,313	1,054	0,355
	Within Groups	81,007	65	1,246		
	Total Groups	83,633	67			

ANOVA						
		Sum of squares	df	Mean square	F	Sig
Semi skimmed dairy Products	Between Groups Within Groups Total Groups	27,376 222,595 249,971	6 65 67	13,688 3,425	3,997	0,023
Fat dairy products	Between Groups Within groups Total Groups	18,694 293,575 312,269	2 65 67	9,347 4,517	2,070	0,134
Fruit	Between Groups Within groups Total Groups	12,933 275,519 288,452	2 65 67	6,467 4,239	1,526	0,225
Vegetable	Between Groups Within groups Total Groups	5,645 191,034 196,679	2 64 66	2,822 2,985	0,946	0,394
Whole Grain Bread	Between Groups Within groups Total Groups	43,461 611,149 654,610	2 63 65	21,731 9,701	2,240	0,115
Rye Bread	Between Groups Within groups Total Groups	1,054 426,351 427,405	2 64 66	0,527 6,662	0,079	0,924
Bran Brad	Between Groups Within groups Total Groups	5,353 543,303 548,655	2 63 65	2,676 8,624	0,310	0,734
White Bread	Between Groups Within groups Total Groups	10,780 558,358 569,138	2 62 64	5,390 9,006	0,599	0,553
Rice pilaf	Between Groups Within groups Total Groups	10,860 187,986 198,846	2 65 67	5,430 2,892	1,877	0,161
Cracked wheat pilaf	Between Groups Within groups Total Groups	2,143 128,762 130,905	2 64 66	1,072 2,012	0,533	0,590
Dark Pilaf	Between Groups Within groups Total Groups	4,372 46,064 50,437	2 63 65	2,186 0,731	2,990	0,057
Leguminous seed	Between Groups Within groups Total Groups	15,330 157,937 173,267	2 65 67	7,665 2,430	3,155	0,049

ANOVA

		Sum of squares	df	Mean square	F	Sig
Soda	Between Groups	7,443	2	3,721	0,720	0,491
	Within groups	330,833	64	5,169		
	Total Groups	338,276	66			
Juice	Between Groups	2,284	2	1,142	0,374	0,690
	Within groups	189,327	62	9,054		
	Total Groups	191,612	64			
Ayran	Between Groups	0,144	2	0,072	0,013	0,987
	Within groups	356,308	65	5,482		
	Total Groups	356,451	67			
Tea (w/o sugar)	Between Groups	9,854	2	4,927	0,405	0,668
	Within groups	778,108	64	12,158		
	Total Groups	787,963	66			
Tea(w/sugar)	Between Groups	11,372	2	5,686	0,484	0,619
	Within groups	740,708	63	11,757		
	Total Groups	752,080	65			
Caffeined drinks	Between Groups	23,431	2	11,715	2,117	0,129
	Within groups	359,645	65	5,533		
	Total Groups	383,076	67			
Convenience foods	Between Groups	2,490	2	1,245	1,154	0,322
	Within Groups	69,038	64	1,079		
	Total Groups	71,528	66			
Baked products	Between Groups	9,961	2	4,980	0,989	0,378
	Within groups	312,299	62	5,037		
	Total Groups	322,260	64			
Dry Fruit	Between Groups	41,510	2	20,755	3,287	0,044
	Within groups	410,397	65	6,314		
	Total Groups	451,907	67			
Salt	Between Groups	3,289	2	1,644	0,869	0,424
	Within groups	119,200	63	1,892		
	Total Groups	122,489	65			
Desert	Between Groups	4,782	2	2,391	1,952	0,150
	Within groups	79,601	65	1,225		
	Total Groups	84,383	67			

There is statistically significant difference in semi- skimmed dairy products, leguminous seed and dry fruits.

Table 21. Differences Between Risk Groups According to Food Consumption of Respondents In Terms of Food Type

Food type	MS Levels (mean)			F	Sig.
	Low	Middle	High		
Semi-skimmed diary products	2,826	2,110	1,040	3,997	0,023
	a		***b***		
Leguminous seeds	1,813	3,121	2,750	3,155	0,049
	b	***a***			
Dry fruit	3,375	2,921	4,690	3,287	0,044
		b	***a***		

Consumption of semi-skimmed dairy products has higher frequency in low level risk groups than high level risk group. There is no significant difference between middle level risk group and the other risk groups.

Consumption of leguminous seeds has higher frequency in middle level risk group than low level risk group. There is no significant difference between high risk group and the other risk groups.

Consumption of dry fruits has higher frequency in high level risk group than middle level risk group. There is no significant difference between low level risk group and the other risk groups.

Table 22. Distribution of Individuals According to MSRF

		n	%
Industrial food	Yes	12	17,6
	No	56	82,4
High blood pressure	Yes	27	39,7
	No	41	60,3
Lose weight	Yes	17	25,0
	No	51	75,0
Abdominal weight	Yes	48	70,6
	No	20	29,4
Heart disease	Yes	48	70,6
	No	20	29,4
Loss of concentration btw meals	Yes	31	45,6
	No	37	54,4
High cholesterol	Yes	38	55,9
	No	30	44,1
Consumption of sugary foods	Yes	24	35,3
	No	44	64,7
Above ideal weight	Yes	63	92,6
	No	5	7,4
Fatigue after meal	Yes	40	58,8
	No	28	41,2
Rice, potato, flour	Yes	36	52,9
	No	32	47,1
Hypoglycemia	Yes	9	13,2
	No	59	86,8
Exercise	Yes	46	67,6
	No	22	32,4
Energy changes	Yes	47	69,1
	No	21	30,9

17,6% of respondents mentioned that they consume industrial food (chocolate bar, potato chips, cereal, etc.) more than 5 times in a week.

39,7% of respondents whose said they have high blood pressure.

25% of respondents stated that weight loss is hard for them.

70,6% of respondents have abdominal weight.

70,6% of respondents whose have relatives with hypertension, heart condition or diabetes.

45,6% of respondents complain about loss of concentration, headache and nausea between meals.

55,9% of respondents have high cholesterol.

35,3% of respondents need to eat sugary foods frequently.

92,6% of respondents claimed that they are above their ideal at least 5 kg weight.

58,8% of respondents usually suffered from fatigue after meal.

52,9% of respondents mentioned that they eat rice, potato or floured foods more than 3 times in a week.

13,2% of respondents have hypoglycemia.

67,6% of respondents mentioned that they do exercise less than 2 times in a week.

69,1% of respondents face with energy changes within the day.

Table 23. General Features In MSRF and Metabolic Syndrome Levels.

		MS								
		Low			Middle			High		
		n	Column N %	Row N %	n	Column N %	Row N %	n	Column N %	Row N %
Industrial food	Yes	1	8,3	8,3	4	11,4	33,3	7	33,3	58,3
	No	11	91,7	19,6	31	88,6	55,4	14	66,7	25,0
High blood pressure	Yes	2	16,7	7,4	11	31,4	40,7	14	66,7	51,9
	No	10	83,3	24,4	24	68,6	58,5	7	33,3	17,1
Lose weight	Yes	1	8,3	5,9	9	25,7	52,9	7	33,3	41,2
	No	11	91,7	21,6	26	74,3	51,0	14	66,7	27,5
Abdominal weight	Yes	7	58,3	14,6	24	68,6	50,0	17	81,0	35,4
	No	5	41,7	25,0	11	31,4	55,0	4	19,0	20,0
Heart disease	Yes	5	41,7	10,4	23	65,7	47,9	20	95,2	41,7
	No	7	58,3	35,0	12	34,3	60,0	1	4,8	5,0
Loss of concentration btw meals	Yes	0	0,0	0,0	13	37,1	41,9	18	85,7	58,1
	No	12	100,0	32,4	22	62,9	59,5	3	14,3	8,1
High cholesterol	Yes	2	16,7	5,3	19	54,3	50,0	17	81,0	44,7
	No	10	83,3	33,3	16	45,7	53,3	4	19,0	13,3
Consumption of sugary foods	Yes	0	0,0	0,0	12	34,3	50,0	12	57,1	50,0
	No	12	100,0	27,3	23	65,7	52,3	9	42,9	20,5
Above ideal weight	Yes	9	75,0	14,3	34	97,1	54,0	20	95,2	31,7
	No	3	25,0	60,0	1	2,9	20,0	1	4,8	20,0
Fatigue after meal	Yes	3	25,0	7,5	18	51,4	45,0	19	90,5	47,5
	No	9	75,0	32,1	17	48,6	60,7	2	9,5	7,1
Rice, potato, flour	Yes	5	41,7	13,9	17	48,6	47,2	14	66,7	38,9
	No	7	58,3	21,9	18	51,4	56,3	7	33,3	21,9

Hypoglycemia	Yes	0	0,0	0,0	2	5,7	22,2	7	33,3	77,8
	No	12	100,0	20,3	33	94,3	55,9	14	66,7	23,7
Exercise	Yes	5	41,7	10,9	23	65,7	50,0	18	85,7	39,1
	No	7	58,3	31,8	12	34,3	54,5	3	14,3	13,6
Energy changes	Yes	5	41,7	10,6	23	65,7	48,9	19	90,5	40,4
	No	7	58,3	33,3	12	34,3	57,1	2	9,5	9,5

33,3% of respondents have high MS risk mentioned that they consume industrial food (chocolate bar, potato chips, cereal, etc.) more than 5 times in a week. Correlatively, 58,3% of industrial food consumers are in high risk level group.

66,7% of high risky respondents whose said they have high blood pressure. Similarly 51,9% of hypertensive patients are in high risk level group.

33,3% of respondents have high MS risk stated that weight loss is hard for them. 52,9% of respondents who claimed to lose weight hard are in middle risk level group.

81% of high risky respondents have abdominal weight. 52,9% of respondents whose have abdominal weight are in middle risk level group.

95,2% of high risky respondents whose have relatives with hypertension, heart condition or diabetes.

85,7% of high risky respondents complain about loss of concentration, headache and nausea between meals.

81% of high risky respondents have high cholesterol. 50% of patients have high cholesterol are in middle risk level group.

57,1% of high risky respondents need to eat sugary foods frequently. On the contrary, none of the low risky respondents mentioned to need them.

95,2% of high risky respondents claimed that they are above their ideal at least 5 kg weight. 54% of over-weighted participants are in middle risk level group.

90,5% of high risky respondents usually suffered from fatigue after meal.

66,7% of high risky respondents mentioned that they eat rice, potato or floured foods more than 3 times in a week.

77,8% of hypoglycemic patients are in high risk level group.

85,7% of respondents have high MS risk mentioned that they do exercise less than 2 times in a week.

90,5% of high risky respondents face with energy changes within the day.

Variance analysis (ANOVA) performed to research statistical differences between risk groups according to demographics, medical conditions and consumption habits of respondents. Only statistically significant results are showed at following table. Confidence level is set at 95% (α: 0,05). Dunnet T3 Test performed as post-hoc procedure in order to reveal significant differences among sub-groups. These are showed below average figures of each factor by letters. (a>b>c)

Table 24. Classification of Metabolic Syndrome Risk Levels Within General Features

Factor	MS Levels (mean)			F	Sig.
	Low	Middle	High		
Disease	1,83	1,59	1,24	7,01	,002
	a	***a***	***b***		
Skipped meal	2,20	2,14	1,60	3,84	,031
	a	***a***	***b***		
Semi-skimmed diary product consumption	2,83	2,11	1,04	4,00	,023
	a	***a***	***b***		
Leguminous seeds consumption	1,81	3,12	2,75	3,15	,049
	b	***a***			
Dry fruit consumption	3,38	2,92	4,69	3,29	,044
		b	***a***		
High blood pressure	1,83	1,69	1,33	5,63	,006
	a	***a***	***b***		
Heart disease	1,58	1,34	1,05	6,53	,003
	a	***a***	***b***		
Loss of concentration btw meals	2,00	1,63	1,14	18,53	,000
	a	***b***	***c***		
High cholesterol	1,83	1,46	1,19	7,59	,001
	a	***b***	***b***		
Consumption of sugary foods	2,00	1,66	1,43	6,24	,003
	a	***b***	***b***		
Above ideal weight	1,25	1,03	1,05	3,57	,034
	a	***b***	***b***		
Fatigue after meal	1,75	1,49	1,10	9,31	,000
	a	***a***	***b***		
Hypoglycemia	2,00	1,94	1,67	6,23	,003
	a		***b***		
Exercise	1,58	1,34	1,14	3,67	,031
	a		***b***		
Energy changes	1,58	1,34	1,10	4,90	,010
	a		***b***		

Respondents at high risk level tend to have disease more than low and middle level risk groups.

Respondents at high risk level tend to skip meals more than low and middle level risk groups.

Consumption of semi-skimmed dairy products has higher frequency in low and middle level risk groups than high level risk group.

Consumption of leguminous seeds has higher frequency in middle level risk group than low level risk group.

Consumption of dry fruits has higher frequency in high level risk group than middle level risk group.

Respondents at high risk level claimed to have relatives with hypertension, heart condition or diabetes more than low and middle level risk groups.

Respondents at high risk level claimed to complain about loss of concentration, headache and nausea between meals more than low and middle level risk groups. Similarly middle level risk group people mentioned the same problem more than low risk group.

Respondents at high and middle risk levels tend to have high cholesterol more than low level risk group.

Respondents at high and middle risk levels need to eat sugary foods more frequently than low level risk group.

Respondents at high and middle risk levels claimed that they are above their ideal at least 5 kg weight more than low level risk group.

Respondents at high risk level suffered from fatigue after meal more occasional than low and middle level risk groups.

Respondents at high risk level have hypoglycemia more than low level risk group.

Respondents at high risk level mentioned that they do exercise less than 2 times in a week more than low level risk group.

Respondents at high risk level face with energy changes within the day more than low level risk group.

5. DISCUSSION AND CONCLUSION

Obesity is multifactorial disease that consist of environmental and genetic factors. Although differences in societies, it increases with age, inadequate education and and marital status (43).

The prevelance of metabolic syndrome increases with age. There are number of studies show that incidence of metabolic syndrome increases with age. According to METSAR, analyses metabolic syndrome prevelance between 20-30 age is 10%, between 60-70 age 75% (44, 45, 46, 47). Also, in this study, age distribution according to MS levels showed that risk levels increase with age. Older respondents have more MS risk than others but there is no statistical difference according to age among MS levels of patients (p=0,144).

The results of gender, females dominance was seen in our data similar to Seerat Hussain Beigh study. Both middle and high level MS groups consist of more females than males (48).

In cross sectional study between 22.180 Chilean Adults is showed that increasing height had a protective effect for metabolic syndrome. It explains this relationship by the increased abdominal obesity observed in shorter individuals (49). Also in our study, we found that average height in middle risk levels is 169,3, in high risk level is 167,0. We showed that risk level decreases with increasing height smilar to Chilean Adults study. There is no statisticaly significant difference according to height among MS levels of patients (p=0,676).

Obesity is defined as an excess amount of body fat that serious and growing health problem in the world. Obesity is frequently associated with diabetes, metabolic syndrome, hypertension, hyperlipidemia, coronary heart disease, stroke and cancer (50). 34% of people over 20 age shows abdominal obesity according to TURDEB study in our country (1). In our study, we showed that avarege weight in middle risk level is 86,5 kg, in high level it is 88,4 kg. We showed that according to metabolic syndrome risk level increases with increasing weigh. When we look at BMI, we showed that there is no statistical differences between metabolic syndrome risk but the risk level increases with increasing BMI.

According to study in Sweden, the risk ratio for the presence of the metabolic syndrome comparing the lowest (< or = 9 years) with the highest (college/university) education was 2,7 (95% CI 1.1-6.8). It shows that low education is associated with

increased risk for metabolic syndrome in middle-aged women (51). Also, the study which was done in Chinese population shows the same result with Sweden study (52). But, in our study, 37,9% of university graduated persons are in high risk profile, 28% of high scool graduated ones are in high risk profile and 20% of middle school graduated individuals in high profile. Low and high level of metabolic syndrome groups consist of more university graduated respondents than other.

Metabolic syndrome is associated with abdominal obesity, diabetes mellitus, hypertension and dyslipidemia such as hypertrigliseridemia and low HDL level (50). One of the most important diseases associated with obesity and hypertension. According to data from NHANES (National Health and Nutrition Examination Survey), every increasing in body mass index associated with progressive blood pressure (53-54). The prevalence of hypertension in men with BMI of 30 and above is 38,2%, compared with 32,2% in women. The prevalence of hypertension in men with BMI of 25 and below is 18,5%, compared with 16,5% in women (50). In our study, the incidence of hypertension seen in patients with the BMI of 25 is 40,6%. Hypertension is the most seen in high level of metabolic syndrome which is 61,5%. There is a strong synergy between BMI and triglyceride which is shown in several studies (55). In our study, the incidence of hyperlipidemia seen in patients with the BMI of 25 is 3,1%. All hyperlipidemic patient seen in middle level of metabolic syndrome. Insulin resistance and compensatory hyperinsulinemia are the main underlying factors in metabolic syndrome and they are also important risk factors for cardiovascular diasease by Reaven (56). According to Fulden Sarac and al Study, the prevelance of impaired glucose tolerance is 33,3% (57). In our study, the incidence of diabetes seen in patients with the BMI of 25 and below is 18,8%. Diabetes is most seen in high level of metabolic syndrome which is 83,3%. According to the distribution of disease, the most common ones are hypertansion (40,6%) and diabetes (18,8%). Usage of medication increases with the risk level as expected.

The development of metabolic syndrome is influenced by environmental factors such as smoking and alcohol consumption. Chronic execessive alcohol consumption leads to increase prevelance in hypertension, coronary artery disease and death (58). Several recent reports addressing the association of MS with alcohol

consumption have showed a lower prevalence with light-to-moderate alcohol intake but higher with heavier intake. Studies suggest that heavy drinking in combined sexes predicted the risk for incident coronary heart disease, while moderate drinking tended to be protective. Heavy intake predicted to increase diabetes and metabolic syndrome risk in men whereas moderate intake was not significantly associated with development of diabetes or metabolic syndrome and it is also reduce the risk of metabolic syndrome in women in a turkish study (59). According to Life Line Cohort study, light alcohol consumption may moderate the negative associations of smoking with MS. Their results suggest that the lifestyle advice that emphasizes smoking cessation and the restriction of alcohol consumption to a maximum of 1 drink/day (60). Another study in Korean found that heavy drinking, in particular among liquor drinkers, is associated with an increased risk of the metabolic syndrome by influencing its components (61). According to our results, 38,1% of high risk group, 25,7% of middle risk group and 33,3% of low level risk group use alcohol. But, there is no statistical differences between metabolic syndrome risk groups and alcohol consumption.

Smoking is the major risk in cardiovascular disease and atherosclorosis (62). In many studies that compare smokers and non-smokers show that smokers have hyperinsulinemia and insulin resistant which cause dyslipidemia and endothelial dysfunction (63, 64, 65). It is known that smokers have high plasma triglyceride and low HDL cholesterol (66). Aydın et al study shows that smokers have high LDL cholesterol and trigylceride and low HDL cholesterol (67). Smilarly, Korea National Health and Nutrition Examination Survey shows that smoking amounts have a statistically significant dose-dependent association with metabolic syndrome also this study found association with smoking and abdominal obesity. The results show that high triglycerides and low HDL cholesterol have a significant dose-dependent association with total pack-years (69). Thus, based on these findings, smoking may be considered as an important modifiable risk factor for metabolic syndrome. When we look at our study, 14,3% of smokers in low, 57,1% in middle and 21,1% in high level risk group but there is no statistical differences between metabolic syndrome risk groups and smoking habits.

Randomised controlled trials have shown that exercise training has a mild or moderate favourable effect on metabolic syndrome. Randomized controlled trials provide regular physical activity to prevent type 2 diabetes in individulas who are overweight and impaired glucose tolerance. When assessing the impact of physical activity on metabolic syndrome, recent recommendations suggest to evaluate physical acitivity with both frequency and intensity. Current recommendations suggest to increase the total volume (frequency, intensity, duration) of moderate-intensity physical activity to maintain good cardiorespiratory and muscular fitness appears to markedly decrease the likelihood of developing the MS, especially in high-risk groups (70). Current guidelines recommend accumulating ≥150 min/week of moderate-to-vigorous physical activity, with no recommendation for frequency. In study by Clarke et all seen that the frequency of physical activity throughout the week was not associated with the MS among active adults. Conversely, the weekly volume of moderate to vigorous physical acitivity was strongly associated with the MS. The frequency of moderate to vigorous physical acitivity throughout the week did not appreciably change the relative odds of the MS or its component risk factors (70). According to study published in Am Journal Of Cardiol that the moderate intensity exercise group was significantly better at improving insulin sensitivity than higher intensity. And this same pattern is also evident in the triglyceride response (71). According to our study 33,8% of respondents doing exercise regularly and just 26,6% of them claimed that doing exercise at least 30 minutes. 81% of respondents in high risk group said that they are not doing exercise. However 58,3% of low risk group are exercisers. 42.9% of low risk group make exercise 3 times or more, 28,6% of them make exercise twice a week and 14,3% of them make exercise once a week. Smilar to other studies we found that there is statistically significant relationship between exercise frequency and metabolic syndrome levels. We found that exercise frequency higher in high level risk patients. As we can see there is limitations about physcial acitivy volume of our study. The physical activity volume and frequency of physical activity should be considered together.

According to Mediterranean study snacking between main meals was significantly associated with higher risk for developing metabolic syndrome after multivariable adjustment. Higher adherence to an unhealthy snacking pattern was also

independently associated with increased incidence of metabolic syndrome. Their findings suggest that avoidance of snacking between main meals can be included among the preventive approaches to reduce the risk of metabolic syndrome development, especially when snacks contain foods of poor nutritional quality (72). According to our study, 33% of respondents who eat snacks three times in day are in low level risk group, 66,7% of them are high level risk group. Also 50% of respondents who eat snacks two times in a day are in middle level risk group. Our study shows that eating energy-dense nutrients between meals may increase metabolic syndrome risk level like Mediterranean study.

It is not clear whether eating meals regularly or skipping meals is associated with the metabolic syndrome. There is just a few studies which assess the association of eating meals regularly with parameters of metabolic syndrome. Cross sectional study done in 3,607 individual found that eating meals regularly is inversely associated to the metabolic syndrome, insulin resistance and high serum concentrarions of glutamyl transferase and suggests that eating meals irregularly may be part of several potential environmental risk factors that are associated with the metabolic syndrome (73). But in our study, we found that 22,6% of respondents who doesn't skip meals are low level risk group, 35,5% of them are in high level risk group and 41,9% of them are in the middle level risk group so further analyses should be required to understand between meal skipping and metabolic syndrome.

The study published in Journal Public Health Nutrition found that poor breakfast can have a negative effect on blood sugar regulation and thus metabolic syndrome. Researchers found an association between eating a poor breakfast and metabolic syndrome (74). Like this study we found that most breakfast skippers (66,7%) are in high level risk group.

Although, individual foods and nutrients have been associated with the metabolic syndrome, whether dietary patterns identified by factor analysis are also associated with this metabolic syndrome is not known. There are limited data on the relationship between the risk factors of the metabolic syndrome and dietary patterns.

Fruits and vegetables contain many nutrients and phytochemicals that are thought that protect against cardiovascular disease and diabetes (75). According to study done in 486 Tahrani, females showed that higher intakes of fruit and vegetables are associated with a lower risk of metabolic syndrome, the lower risk may be due to the result of lower CRP concentrations (76). Similar to Tahrani study, Castango et al showed that vegetable intake did not show protective effects / risk for the presence of metabolic syndrome and its components but recommended intake of fruit revealed a protective effect against metabolic syndrome and recommended intake of fruit had a protective effect not only for metabolic syndrome but also for its components (77). The benefical effects of fruit and vegetable intakes in the framework of dietary patterns were reported previously, it has been shown that dietary patterns rich in fruit and vegetable may reduce the risk of metabolic syndrome (78,79). However, our study shows no difference about fruit and vegetable consumption between high risk, low risk, middle risk group of metabolic syndrome.

Dairy products such as cream, butter, yoghurt, kefir and cheese are widely consumed because it provides important macro and micro elements and it is an essential component of the diet for several millions of people in the world (80). Ca supplements improve the serum lipoprotein profile, particularly by decreasing serum total and LDL-cholesterol concentrations. They also lower systolic and diastolic blood pressure. Dietary proteins may increase satiety in both the short and longer term, which may result in a reduced energy intake (81). This dairy proteins suggested as reducers of adipose mass and body weight (80).To reduce the intake of saturated fatty acid, the consumption of low-fat instead of high-fat dairy products is recommended. In conclusion, more research is warranted to better understand the physiological effects and the mechanisms involved of dairy products in the prevention and treatment of the metabolic syndrome (81). Zemel et al supplemented 20 obese patients with skimmed milk for 28 day and recorded significantly lower oxidative stress and inflammation (82). Australian study reported association between metabolic syndrome and Type 2 diabetes and dairy consumption in 1824 patient. It shows that highest consumption of dairy products witnessed a risk reduction in metabolic syndrome of 59% (83). Similar to other

studies, we showed that consumption of semi- skimmed dairy products has higher frequency in low and middle level risk groups than high level risk group.

Whole grains contain higher amounts of fiber, vitamin E, magnesium, antioxidants and the protective effects of which against chronic disease risk have been shown by previous studies (84). Greater intakes of many constituents of whole grains, including dietary fiber, vitamin E, folate and magnesium, have been independently associated with reduced metabolic risks related to metabolic syndrome. The Food Guide Pyramid of the US Department of Agriculture recommends consumption of 6–11 servings of grain products per day, but the amount of whole grains is not specified. Study done in Tehranian adults reported that whole-grain intake is inversely, and refined-grain intake is directly, associated with metabolic risks (85). Sahyoun NR et al reported that fasting glucose concentrations and body mass index decreased across increasing quartile categories of whole-grain intake independent of confounders, whereas intake of refined grain was positively associated with higher fasting glucose concentrations and a higher prevalence of the metabolic syndrome (86). But in our study, there is no statistically significant differences according whole grain consumption and MS levels of patients.

Legumes are one of the healthy and inexpensive foods. They are high in phytochemicals, fibre, protein, minerals and vitamins. Legumes are commonly rich in fiber, calcium, potassium and magnesium. In epidemiologic studies, high consumption of calcium, potassium and magnesium and low consumption of sodium have been associated with reduced metabolic risks (87). Legumes has been reported that they protect individuals from development of diabetes, cardiovascular disease and cancer but the pathophysiologic mechanisms underlying these effects of legume intake are not fully understood, although the fiber and magnesium of legumes may explain these associations. Dietary patterns that include increased legume intake have been shown as inversely associated with metabolic syndrome. Long term experimental studies have shown that inclusion of legumes in the diets of patients with obesity and cardiovascular disease resulted in improved glucose disposal (88). A meta analysis of ramdomized controlled trials indicates that diet rich in legumes other than soy decreases total and LDL cholesterol (89). Alizadeh et al study shows legumes had beneficial effects on TG

compared to legume-less diet. Also, this study indicates that legumes had not beneficial effects on insulin and HOMA-IR in consistent with other previous studies. However, studies on diabetic or insulin resistant participants showed beneficial effects of legumes on insulin resistance parameters (89). Previous studies have reported that legume intake, as a low glycemic index food, benefically effects weight loss via satiety signals such as cholecystokinin and glucagon-like peptide-1 to the satiety center in hypothalamus, which causes a subsequent reduction in food intake (88). Unlike previous studies, our study shows that consumption of leguminous seeds has higher frequency in middle level risk group than low level risk group. This result due to the independent of the consumption of leguminious seed with other group of food such as whole grains, dairy products and fruits, vegetables. It may be also due to the traditional food culture of Turks. Because in Turkey, leguminious seed are cooked with butter and eaten with rice whose glycemic index is high. So, it should be noted that most likely over all diet quality may protect against metabolic syndrome.

The glycemic index (GI) is defined as "the incremental area under the blood glucose curve following ingestion of a test food, expressed as a percentage of the corresponding area following an equivalent load of a reference carbohydrate, either glucose or white-wheat bread" (90, 91). Observational studies shows that the GI of the diet may be an important determinant of metabolic syndrome risk (92). Glisemic index has been shown to be positively associated with the prevalence of the metabolic syndrome and insulin resistance in a cross -sectional study of 2834 subjects from the Framingham Offspring cohort (93). In animals and in short-term human studies, a high intake of carbohydartes with high glycemic index produced greater insulin resistance than did the intake of low glycemic index carbohydrates. In large prospective epidemiological studies, both the glycemic index and the glycemic load of the overall diet have been associated with the risk of type 2 diabetes in both and women (94). According to our study, 66,7% of high risky respondents mentioned that they eat rice, potato or floured foods (high GI foods) more than 3 times in a week.

Fructose (sometimes called fruit sugar) is a natural sugar that is mainly found in fruits and honey, with smaller amounts found in some vegetables. Studies about healthy and diabetic subjects demonstrated that fructose produced a smaller

postprandial rise in glucose and serum insulin than other carbohydrates. Fructose stimulates insulin secretion less than does glucose and glocose-containing carbohydrates. Because insulin increases leptin release, lower circulating insulin and leptin after fructose ingestion might inhibit apetite less than consumption of other carbohydrates and lead to increased energy intake (95). Although fructose alone is less insulinogenic and glucogenic than equal amounts of glucose or sucrose, when consumed with glucose and after dietary adaptation to a mixed diet containing fructose, these responses usually are not different from responses after dietary adaptation together sugars, or are greater than after dieatary adaptation to complex carbohydrate diets. Dietary fructose has resulted in increases in uric acid, blood pressure and lactic acid. People who are hypertensive, hyperinsulinemic, non-insulin dependent diabetic, hypertriglyceridemic are more susceptible to these adverse affects of dietary fructose than healthy young subjects (96). High fructose diet compared with high starch diet resulted in significantly higher fasting serum total and LDL cholesterol and also caused transient changes in postprandial serum lactate and trigylcerides (97). The study was conducted in the General Clinical Research Center at Fairview- University of Minnesota Medical Center includes 24 healthy volunteers. It shows dietary fructose was associated with increased fasting and postprandial plasma triacylglycerol concentrations in men. It suggests that replacement of fructose with glucose (98). According to our study, we found that consumption of dry fruits has higher frequency in high level risk group than middle level risk group. These results are thought to be out of the dry fruit's high fructose content.

Industrial foods have higher saturated fat, sugar and high fructose. Increase in the incidence of obesity is related to fast food industry. CARDIA study indicates that fast food consumption has positive associations with weight gain and insulin resistance and suggesting that fast food increases the risk of obesity and type 2 diabetes (99). Our study indicates that 33,3% of respondents have high MS risk mentioned that they consume industrial food more than 5 times in a week. Correlatively, 58,3% of industrial food consumers are in high level risk group. So, we suggest that high consumption of industrial food may have an association with metabolic syndrome and obesity.

Metabolic syndrome is a major health problem that affects people all around the world and in our country. It has lots of underlying multifactorial causes. Main components of the metabolic syndrome are insulin resistance and obesity.

In our study, metabolic syndrome risk factors compared with obesity, age, gender, physical activity, marital status, education level, alcohol consumption and snack consumption. All of the individuals in the sample were at different levels of risk for metabolic syndrome. Demographic characteristics such as age, weight, height and dieatary patterns were found to be associated with the metabolic syndrome.

Medical nutrition therapy is important in the prevention and treatment of chronic diseases which is a component of metabolic syndrome. While it is firmly established that weight reduction is a powerful measure for the treatment of the metabolic syndrome, long term intervention studies are still needed to establish how changes in the diet composition can influence metabolic syndrome in humans.

Several limitations need to be considered in the interpretation of our findings. We assessed the dietary patterns by using food frequency questionnaire only but food intake data may be also collected for detailed dietary information. The other limitation of our study is its cross sectional nature. Thus, the association betwen these diearty patterns and the metabolic syndrome remains to be confirmed in prospective analysis. We can not generalize our findings to all Turkish people because of respondents higher socioeconomic status.

The current findings indicate that a dietary pattern characterized by high comsumption of dry fruit and associated with the increased risk of metabolic syndrome and increase consumption of semi-skimmed dairy products associated with the reduced risk of metabolic syndrome. Unlike that, a dietary pattern with high amounts of industrial foods which consume more saturated fat and sugar and high GI foods is associated with a gerater risk of the metabolic syndrome.

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7. APPENDICES

7.1. Ethical Approval

T.C. YEDİTEPE ÜNİVERSİTESİ

Sayı : 37068608-6100-15-1044 30/ 04 / 2015
Konu: Etik kurul Başvurusu hk.

İlgili Makama (Sayın Özge Yüksel)

Yeditepe Üniversitesi Biyokimya Anabilim Dalı Prof.Dr.Serdar Öztezcan ve Özge Yüksel'in sorumlu olduğu "**Özel Bir Hastanenin Diyet Polikliniğine Başvuran Kilolu Ve Obez Bireylerin Metabolik Sendrom Risk Düzeylerinin Belirlenmesi Ve Riskli Bireylerin Beslenme Alışkanlıklarının Karşılaştırılması**" isimli araştırma projesine ait KAEK Başvuru Dosyası (1038 kayıt sayılı KAEK Başvuru Dosyası), Yeditepe Üniversitesi Klinik Araştırmalar Etik Kurulu tarafından 29-04 2015 tarihli toplantıda incelenmiştir.

Kurul tarafından yapılan inceleme sonucu; çalışmanın yapılmasında etik ve bilimsel açıdan uygun olduğuna karar verilmiştir (Karar No: **58/482**).

Bilginizi ve gereğini saygılarımla arz ederim.

Prof. Dr. Turgay ÇELİK
Yeditepe Üniversitesi
Klinik Araştırmalar Etik Kurulu Başkanı

Yeditepe Üniversitesi 26 Ağustos Yerleşimi, İnönü Mahallesi Kayışdağı Caddesi 34755 Ataşehir / İstanbul
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7.2. Informed Consent Form

ÇALIŞMANIN ADI : Özel Bir Hastanenin Diyet Polikliniğine Başvuran Kilolu ve Obez Bireylerin Metabolik Sendrom Risk Düzeylerinin Belirlenmesi ve Riskli Bireylerin Beslenme Alışkanlıklarının Karşılaştırılması

DANIŞANA UYGULANACAK ÇALIŞMA : Anket

Bu anket ; yukarıda bahsedilen araştırma için yapılacak olup herhangi bir tanı veya tedaviyi kapsamaz. Verilen bilgiler gizli tutulacaktır.

DANIŞANIN ADI SOYADI :

ARAŞTIRMACININ ADI SOYADI :

ARAŞTIRMACI

Hastaya araştırmayla ilgili genel bir bilgilendirme tarafımdan yapılmıştır

Tarih :

Ad Soyad :

İmza :

HASTA

Gerekli bilgilendirme tarafıma yapılmış olup araştırmaya katılmayı kabul ediyorum.

Tarih :

Ad Soyad :

İmza :

7.3. Personal Information Questionnaire

A. GENERAL INFORMATION

1. Age :.....
2. Job :.....
3. Gender :.....
4. Marital status: a.Married b. Single
5. Height:.....cm
6. Weight :.....kg
7. Educational status :

a. Not literate b.Literate c. Secondary school graduates

d. High school graduates e. Graduates from university

8. Do you have any diseases determined by doctor diagnose ?

a. Yes .....b. No

9. If your answer yes, write your illness.

…….

10. If your answer is yes, do you regularly use medicine ?

a. Yes .....b. No

11. Do you smoke?

a. Yes .....b. No

12.Do you use alcohol?

a. Yes.....b. No

13. Do you do exercise?

a.Yes.....b. No

14.If your answers is yes,how often do you do exercise?

a. 1 day per week b. 2 day per week c. Everyday d. Never e. 3 days or more per week

15.If your answer is yes, how long do you do exercise?

a. less than 30 minutes b. At least 30 minutes c.at least 45 minutes d. at least 60 minutes e. 1 hour or more per hour

B. Eating Habits

16. How many meals do you eat per day?

..... Main meals ..... snack

17. Do you skip meals?

a. Yes b. No

18.If you skip meals, most of which ?

a. Breakfast b. Lunch c. Dinner

7.4. Food Consumption Frequnecy Questionnaire

Food Groups	Everyday	3 or 5 times in a week	1 or 2 times in a week	Once in a 15 days	Once a month	Never
Red meat						
Fish meat						
Chicken meat						
Butter						
Margarine						
Tail fat						
Olive oil						
Sunflower oil						
Corn oil						
Egg						
Skimmed milk						
Semi-skimmed milk						
Whole milk						
Skimmed cheese						
Semi-skimmed cheese						
Skimmed yoghurt						
Semi skimmed yoghurt						
Whole yoghurt						
Salt						
Fruit						
Vegetable						
Salad						
Dessert						
Whole grain bread						
Rye bread						
Bran bread						
White bread						
Legumes						
Rice pilaf						
Cracked wheat pilaf						

Brown rice pilaf						
Soda						
Fruit juice						
Ayran						
Unsweetened tea						
Sweetened tea						
Caffeinated drinks						
Baked products						
Offal						
Nuts						
Processed meat products; sousage, salami						
Industrial foods						

7.5. Metabolic Syndrome Research Form

1. Dou you eat, chocalate bar, potato chips, cornflakes and similar products more than 5 times in a week?

a)Yes

b)No

2. Have your blood pressure measured high?

a) Yes

b) No

3. Are you struggling to lose weight despite regular exercise?

a) Yes

b) No

4. Do you have weight espacially around your abdomen and waist?

a) Yes

b) No

5. Do you have any relatives that have cardiovascular diseases and diabetes mellitus?

a) Yes

b) No

6. Do you have loss of concentration, headaches, nausea between meals?
a) Yes

b) No

7. Is your cholesterol high?

a) Yes

b) No

8. Do you often feel the need to eat sugary foods?

a) Yes

b) No

9. Is your weight higher than ideal weight 5 kg or more?

a) Yes

b) No

10. Do you feel tired after dinner?

a) Yes

b) No

11. Do you eat rice, potato and flour containing foods more than 3 times in a week?

a) Yes

b) No

12. Do you have low blood sugar?

a) Yes

b) No

13. Are you doing exercise less than 2 times in a week?

a) Yes

b) No

14. Do you live energy ups and downs during the day?

a)Yes

b) No

Assessment:

0-4 YES: Metabolic syndrome risk level is low

5-8 YES: Moderate risk for metabolic syndrome, investigation is recommended.

9-14 YES: High risk for metabolic syndrome, must be treated

7.6. Curriculum Vitae

Kişisel Bilgiler

Adı	Özge	**Soyadı**	YÜKSEL
Doğum Yeri	İstanbul	**Doğum Tarihi**	03,05,1991
Uyruğu	T.C.	**Tel**	05533603570
E-mail	Ozzge_991@hotmail.com		

Öğrenim Durumu

Derece	**Alan**	**Mezun olduğu Kurumun Adı**	**Mezuniyet yılı**
Doktora	-	-	-
Yüksek Lisans	Beslenme ve Diyetetik	Yeditepe Üniversitesi	2016
Lisans	Beslenme ve Diyetetik	Yeditepe Üniversitesi	2013
Lise	Fen	Ümraniye Anadolu Lisesi	2009

İş Deneyimi

Görevi	**Kurum**	**Süre (Yıl-Yıl)**
Diyetisyen	Anadolu Sağlık Merkezi	**04/2014- halen**

Bilgisayar Bilgisi

Program	**Kullanma Becerisi**
Microsoft Office Word-excel-power point-outlook	Çok iyi
BEBİS- Beslenme Bilgi Sistemi	Orta
SPSS	Orta

Bildiği Yabancı Dilleri	
İngilizce	İyi