Turkish Journal of Health Science and Life

THE EFFECT OF OBESITY ON THE MENSTRUAL PERIOD AND HORMONAL PARAMETERS

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ARTICLE INFO

Article history:
Received: 13 April 2019
Accepted: 06 December 2019
Available Online: 31 December 2019

Key Words:

Obesity, Menstrual Period, Hormones

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Turkish Journal of Health Science and Life
2019, Vol.2, No.2, 25-30

ABSTRACT

Obesity is a public health and economic problem which is very common in almost all societies globally. Studies have shown that obesity causes many gynecological and obstetric problems such as anovulation, menstrual irregularity, infertility, abortion and adverse pregnancy outcomes. In our study, we aimed to evaluate the effect of obesity on menstrual cycle and some hormonal parameters, obstetric and gynecological results.

In this study, the files of the patients admitted to Burdur State Hospital Gynecology and Obstetrics Clinic and Internal Medicine Clinic were analyzed retrospectively. A total of 200 patients (100 non-obese, BMI ≤ 29,9 and 100 obese, BMI ≥ 30) were included in the study. The ages of the patients, the first menstrual age (FMA), menstrual periods and whether they used cigarettes were obtained from the records of the physicians and transferred to the forms. In addition, hemoglobin (Hb) values, thyroid stimulating hormone (TSH) values, insulin and glucose values and finally vitamin D values were transferred from the system to the forms.

There was no statistically significant difference the ages, FMA, Hb and TSH values and smoking rate between these two groups. Also, there was a statistically significant difference BMI, vitamin D values, IR and the menstrual period between the two groups.

As a result, obesity is an increasing public health problem, especially in developed countries, all over the world and in our country. Obesity in IR and vitamin D deficiency should be kept in mind and preventive health policies with obesity can be prevented.

1. Introduction

Obesity is a public health and economic problem which is very common in almost all societies globally. Obesity prevalence rates are an epidemic that increases worldwide (1). According to World Health Organization data, obesity has doubled since 1980. When these figures are expressed as prevalence, the prevalence of obesity is around 11% (2). In studies conducted in Turkey in the prevalence of obesity is being developed western countries remain below the figure has reached to Middle East. The prevalence of obesity in Turkish population has increased to 41% in females and 20.5% in males (3).

Body mass index (BMI) is the simplest method of diagnosing obesity. BMI is calculated by dividing the person's body weight (kg) by the square of height (m^2). According to this calculation, BMI between 18.5-24.9 kg/m^2 normal, 25-29.9 kg/m^2 of light weight, between 30-39.9 kg/m^2 of obese and 40 kg/m^2 or over classifies as morbid obese (1).

Studies have shown that obesity causes many gynecological and obstetric problems such as anovulation, menstrual irregularity (especially prolongation and increase in the amount of menstrual bleeding), infertility, abortion and adverse pregnancy outcomes (4). In some studies, it has been shown that obesity affects the age of menarche in adolescent girls (5,6). It was also found that the harmful effects were much higher in smoker obese patients (7).

There is a resistance to glucose intolerance and insulin in obese patients. Insulin level is also increased to balance blood glucose levels. Increased insulin level causes androgen production in ovarian stroma. Also, sex hormone-binding globulin causes a decrease in the liver. This causes a vicious cycle between obesity and insulin resistance (8).

Thyroid hormone disorders may cause disorders in the menstrual cycle. While thyrotoxicosis usually causes hypomenorrhea and polymenorrhea, hypothyroidism is associated with oligomenorrhea. In addition, thyroid hormone disorders may cause infertility (9).

Studies have shown that vitamin D deficiency is involved in the etiology of many chronic diseases such as diabetes, cardiovascular disease and obesity (10,11). In our study, we aimed to evaluate the effect of obesity on menstrual cycle and some hormonal parameters, obstetric and gynecological results.

2. Materials and Methods

In this study, the files of the patients admitted to Burdur State Hospital Gynecology and Obstetrics Clinic and Internal Medicine Clinic between March 2018 and December 2018 were analyzed retrospectively. A total of 200 patients (100 non-obese, BMI ≤ 29.9 and 100 obese, BMI ≥ 30) whose sociodemographic information and analysis results were complete were included in the study. BMI was found by dividing the weight (kg) of patients by the square of their height (m^2).

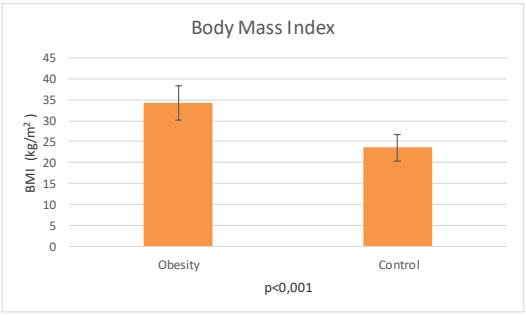
The ages of the patients, the first menstrual age (FMA), menstrual periods and whether they used cigarettes were obtained from the records of the physicians and transferred to the forms. In addition, hemoglobin (Hb) values, thyroid stimulating hormone (TSH) values, insulin and glucose values and finally vitamin D values were transferred from the system to the forms. Insulin resistance (IR) was calculated using the Homeostasis Model Assesment (HOMA) formula. HOMA: [fasting insulin (µu/ml) x fasting plasma glucose (mg/dl)] / 405 was calculated by equation, patients with HOMA score ≥2.5 were considered to have positive insulin resistance (HOMA-IR[+]).

Statistical Package for Social Sciences (SPSS) Windows 17.0 program was used for statistical analysis. In addition to descriptive statistical methods (mean, standard deviation), Mann Whitney U test was used to compare two independent groups when evaluating work data. The results were evaluated at a confidence interval of 95% and a significance level of $p < 0.05$.

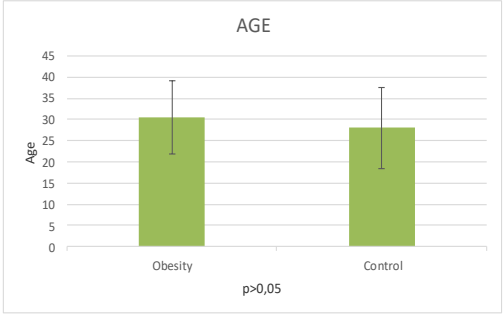
3. Results

A total of 200 patients were included in the study, 100 in the study group (obese) and 100 in the control group. Among the groups included in the study, the mean BMI was 23.5 ± 3.24 in the control group and 34.3 ± 4.08 in the obese group. A statistically significant difference was observed between the two groups (Graph 1).

The mean age of 100 patients in the obese group was 30.55 ± 8.7 years and was 28.03 ± 9.57 years in the control group. There was no statistically significant difference between the ages of the patients (Graph 2). No significant difference was observed between FMA of the patients in the obese group included in the study. FMA of the obese



Graph 1. The mean BMI was in the control and obese group.



Graph 2. The mean age was in the control and obese group.

group was 13.09 ± 1.70 and control group was 13.24 ± 1.62 (Graph 3).

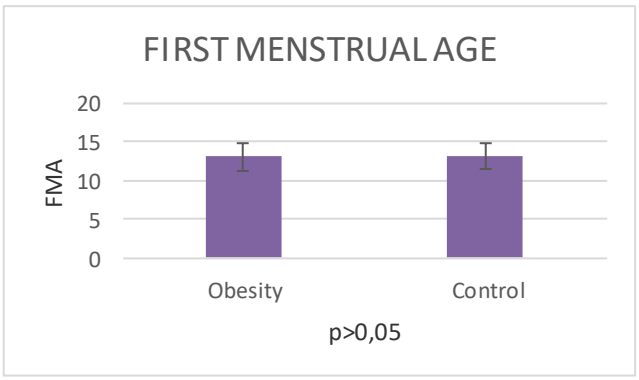
In laboratory analysis, hemoglobin values were 13.23 ± 1.33 gr/dl in the obese group and 13.23 ± 1.38 gr/dl in the control group. TSH values were 2.11 ± 1.19 µIU/ml in he obese group and 2.34 ± 1.29 µIU/ml in the control group. No statistically significant difference was found in these two laboratories analyzes. In the vitamin D values, the mean value of the obese group was 9.93 ± 5.48 IU and the control group was 13.9 ± 9.65 IU. Vitamin D level was found to be below normal values in both groups. When the two groups were compared, vitamin D level was found statistically lower in the obese group than the control group. When we look at IR, the mean value of the obese group is 5.30 ± 4.32 and the control group 2.33 ± 1.19. There was a statistically significant difference between the groups for IR (Graph 4).

Smoking rate among the groups is 26% of the obese group and 31% of the control group. No statistically significant difference was observed between these two groups (Graph 5).

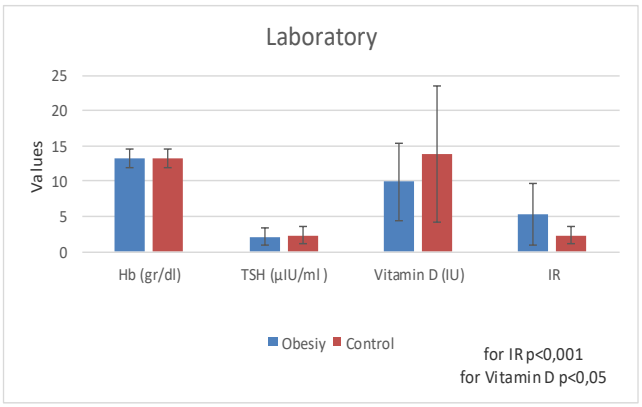
The menstrual period between the groups indicated that 31% of the obese group had regular menstrual periods and 69% had irregular menstrual period, while 68% of the control group had regular menstrual periods and 32% had irregular menstruation. When these ratios are compared, we see that there is a statistically significant difference (Graph 6).

4. Discussion

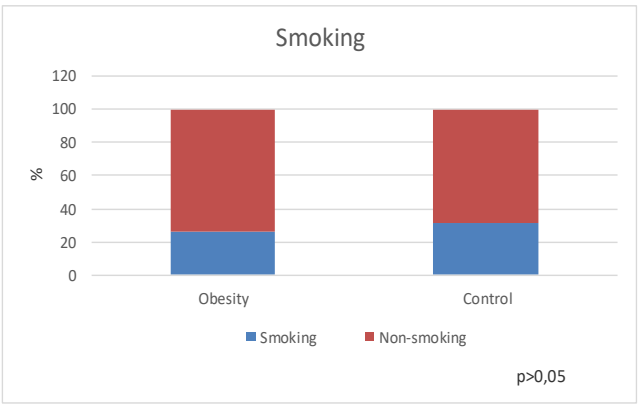
Obesity means excessive amounts of fat in the body. Obesity has become an epidemic problem in the world as it is seen in developing countries as well as in developed countries. Obesity has an important role in health expenditures with diseases caused by obesity. Because obesity causes many organic, systemic, hormonal, metabolic, aesthetic,



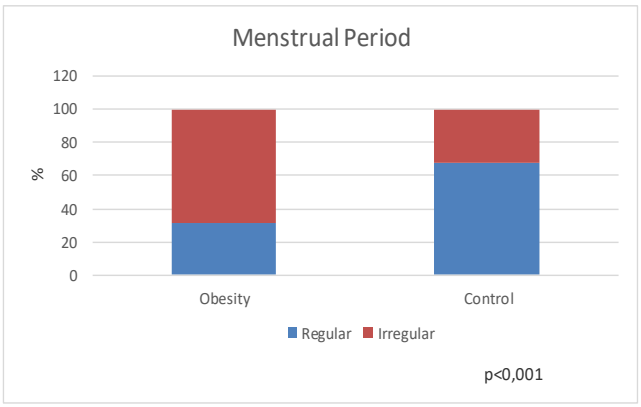
Graph 3. The mean FMA was in the control and obese group.



Graph 4. Laboratory values were in the control and obese group.



Graph 5. Smoking was in the control and obese group.



Graph 6. The menstrual period was in the control and obese group.

spiritual and social problems. In this respect, prevention of obesity as well as treatment is important (4,12,13).

Genetic, physiological, behavioral, sociocultural and environmental factors pave the way for the development of obesity. Obesity is more common in women than men. Since women are menarche, fluctuations in hormonal balance may cause obesity until menopause (14). In our study, we dealt obese women and non-obese women in reproductive period.

Turkey Nutrition and Health Research Commission reported that obesity is more common in later years in 2010 (15). Doğan et al. in their research in Afyon region, they calculated the prevalence of obesity, women over 29 years of age were more likely to have obesity than women aged 19-29 years (16). In our study, no significant difference was found between the groups. We believe that many factors, especially childhood and adolescent eating habits, affect the age and therefore obesity can be seen in almost every age.

Ersoy et al. in their study, it was seen that young girls with BMI over 25 had secondary lags with the addition of secondary causes such as polycystic ovaries (17). Elizondo et al. in their study in 2017, they found that sexual maturation, such as the first menstrual age, developed late in adolescents (18). In our study, no statistically significant difference was found. We think that the reasons for this may be that the patients are overweight or obese during adolescence.

Obesity has relations with menstrual irregularities. Kulise et al in their a cross-sectional study, 30% of overweight women and 47% of obese had menstrual irregularities (19). Mustaqeem et al. in their study with 220 patients, they found menstrual irregularity 24% in obese group, 14.09% in overweight patients and 9.5% in normal weight patients (20). In addition, Norman et al. reported that menstrual irregularity and fertility change positively with women giving about 5 kg (21). In a study conducted on adolescents, obesity contributed to polycystic ovary syndrome and menstrual irregularities and weight loss decreased these symptoms (22). In our study, 69% of the obese and 32% of the non-obese group had menstrual irregularities, and there was a statistically significant difference when these two groups were compared. For this reason, our study contributes to the literature. Studies are still carried out on the cause of menstrual irregularity of obesity. In some studies, the involvement of fat tissue in hormone production and metabolism such as endocrine organ and the effects of these hormones on menstrual cycle and causing menstrual irregularities are mentioned (23,24).

Especially, it is stated that harmful effects are more in obese patients. In a study by Garcia et al., they showed that obese patients had a positive effect on mortality and morbidity with smoking cessation (25). Dare et al. in their study, weight gain in patients after smoking cessation (26). In our study, there was no difference in smoking between both groups. This shows us that patients are more aware of the harmful effects of smoking.

Nead et al. in their study in the pediatric group, they showed that iron deficiency in obese adolescents was twice as high as non-obese children (27). Ausk KJ. et al. in their study, adult group was taken as base and same results were obtained (28). There are not many studies about anemia in the literature search. Kara et al. in their study in Turkey, they detected no significant difference in hematocrit and hemoglobin levels of hematological parameters (29). There was no significant difference in our study. This also supports the work in Turkey.

Kara et al. In their study, there was a positive correlation between TSH levels and IR (29). In 2010, Marzullo et al. in their study, hypothyroidism was found in obese patients (30). When we look at the literature again, it is seen that there is a positive ratio between TSH level and BMI (31-33). Müderrisoğlu et al. in their study, there was no significant difference between thyroid hormones

and obesity (34). In our study, patients with hypothyroidism were more common in the obese group. However, no significant difference was found between the two groups in terms of TSH levels. This also supports the work of Müderrisoğlu et al.

IR emerged through genetic and environmental mechanisms. Genetic causes include insulin receptor, glucose transporter and signal protein mutation. Environmental factors include sedentary life, unhealthy nutrition, obesity, drugs, glucose toxicity, increased free fatty acids and advanced age (35). The effect of insulin on obese patients differs from normal individuals. Lipolysis significantly increases in obese, especially in the abdomen. This results in decreased insulin sensitivity in the liver (36). There are significant differences in menstrual cycle and insulin sensitivity in studies on women with polycystic ovary syndrome (PCOS). IR is shown in the group with irregularities in women with PCOS, while IR cannot be shown in the group with regular order (37). In studies performed in obese women with PCOS, IR appears to be normalized with the reduction of abdominal fat (38). These observations have shown a strong bond between obesity, PCOS, menstrual irregularity and IR. Our study supports the literature because, there is a significant difference between the groups in terms of IR.

The source of vitamin D is the sun's rays, and the most important reason for its deficiency is the inability to benefit from the sun. Vitamin D deficiency is widely observed in all over the world, including in areas with dense sun (39,40). Ortega et al. reported that vitamin D levels in overweight and obese patients were lower than normal weight (41). Also, Konradsen et al. reported an inverse relationship between BMI and vitamin D levels in their study (42). When the causes of vitamin D deficiency in obesity are investigated, increase in immobilization with weight gain, as a result of less use of sunlight and secretion of vitamin D in adipose tissue (43,44). In our study, vitamin D levels were found to be low in both groups and vitamin D levels were lower in obese individuals than the other group. This shows that our study supports the literature.

As a result, obesity is an increasing public health problem, especially in developed countries, all over the world and in our country. Obesity in IR and vitamin D deficiency should be kept in mind and preventive health policies with obesity can be prevented.

Conflict of Interest:

The authors declare no conflicts of interest.

Acknowledgements:

The authors are grateful to Prof. Dr. Mehmet Okan Özkaya for his contributions.

References

1) World Health Organization (WHO), Obesity: preventing and managing the global epidemic. 2000: World Health Organization.
2) WHO, E.C. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet,2004. 363:p.157.
3) Sağlık Bakanlığı Sağlık Araştırmaları Genel Müdürlüğü, Hacettepe Üniversitesi Sağlık Bilimleri Fakültesi Beslenme ve Diyetetik Bölümü, Ankara Numune Eğitim ve Araştırma Hastanesi. Türkiye Beslenme ve Sağlık Araştırması 2010: Beslenme Durumu ve Alışkanlıklarının Değerlendirilmesi Sonuç Raporu. Sağlık Bakanlığı Yayın No: 931, Ankara 2014.
4) Jungheim ES, Travieso JL, Hopeman MM. Weighing the impact of obesity on female reproductive function and fertility. Nutr Rev. 2013; 71: 3-8.
5) Chitnis T, Graves J, Weinstock-Guttman B, Belman A, Olsen C, et al. U.S. Network of Pediatric MS Centers. Distinct effects of obesity and puberty on risk and age at onset of pediatric MS. Ann Clin Transl Neurol. 2016;3(12):897-907.
6) Elizondo-Montemayor L, Hernández-Escobar C, Lara-Torre E, Nieblas B, Gómez-Carmona M. Gynecologic and Obstetric Consequences of Obesity in Adolescent Girls. J Pediatr Adolesc Gynecol. 2016; 22: 1083-1088.
7) García Álvarez A, Serra-Majem L, Castell C, Ribas-Barba L, Méndez MA. Trends in the association between smoking history and general/central obesity in Catalonia, Spain (1992-2003). Nutr Hosp. 2017;34(1):102-110.
8) Daniiliis A, Dinas K. Long term health consequences of polycystic ovarian syndrome: a review analysis. Hippokratia 2009; 13: 90-92.
9) Krasssas GE, Poppe K, Glinoer D. Thyroid function and human reproductive health. Endocr Rev. 2010; 31: 702-755.
10) Rajakumar K, Fernstrom JD, Holick MF, Janosky JE, Greenspan SL. Vitamin D status and response to Vitamin D (3) in obese vs. non-obese African American children. Obesity. 2008; 16: 90-95.

11) Martini LA, Wood RJ. Vitamin D and blood pressure connection: update on epidemiologic, clinical, and mechanistic evidence. Nutr Rev 2008; 66: 291-297.

12) Barnett R. Obesity. Lancet 2005;365:1843.

13) Cordero A et al. Casasnovas on behalf of the MESYAS Registry investigators. Gender differences in obesity related cardiovascular risk factors in Spain. Preventive Medicine 2009; 48: 134–139.

14) Davis SR, Castelo-Branco C, Chedraui P, Lumsden MA, Nappi RE, Shah D, et al. Understanding weight gain at menopause. Climacteric 2012; 15: 419-429.

15) Türkiye Beslenme ve Sağlık Araştırması 2010: Beslenme Durumu ve Alışkanlıklarının Değerlendirilmesi Sonuç Raporu. Hacettepe Üniversitesi Sağlık Bilimleri Fakültesi Beslenme ve Diyetetik Bölümü. Sağlık Araştırmaları Genel Müdürlüğü Yayın No: SB-SAG-2014/02, Ankara Şubat, 2014.

16) Doğan N, Toprak D, Demir S. Prevalence of Obesity and Associated Risk Factors in Afyonkarahisar-Turkey. Türkiye Klinikleri J Med Sci. 2011; 31: 122-132.

17) Ersoy B, Balkan C, Gunay T, Egemen A. The factors affecting the relation between the menarcheal age of mother and daughter. Child: Care, health & development 2005; 31: 303-308.

18) Elizondo-Montemayor L, Hernández-Escobar C, Lara-Torre E, Nieblas B, Gómez-Carmona M. Gynecologic and Obstetric Consequences of Obesity in Adolescent Girls. J Pediatr Adolesc Gynecol. 2017 Apr;30(2):156-168.

19) Kulie T, Slattengren A, Redmer J, Counts H, Eglash A, Schrager S. Obesity and women's health: an evidence-based review. J Am Board Fam Med 2011; 24(1): 75-85.

20) Mustaqeem M, Sadullah S, Waqar W, Farooq MZ, Khan A, Fraz TR. Obesity with irregular menstrual cycle in young girls. Mymensingh Med J. 2015;24(1):161-167.

21) Norman RJ, Noakes M, Wu R, Davies MJ, Moran L, Wang JX. Improving reproductive performance in overweight/ obese women with effective weight management. Hum Reprod Update. 2004;10(3):267-80.

22) Marzouk TM, Sayed Ahmed WA. Effect of Dietary Weight Loss on Menstrual Regularity in Obese Young Adult Women with Polycystic Ovary Syndrome J Pediatr Adolesc Gynecol. 2015; 28: 457-461.

23) Weiss DJ, Charles MA, Dunaif A, Prior DE, Lillioja S, Knowler WC, Herman WH. Hyperinsulinemia is associated with menstrual irregularity and altered serum androgens in Pima Indian women. Metabolism. 1994; 43: 803-807.

24) Wei S, Schmidt MD, Dwyer T, Norman RJ, Venn AJ. Obesity and menstrual irregularity: associations with SHBG, testosterone, and insulin.Obesity. 2009;17: 1070-1076.

25) García Álvarez A, Serra-Majem L, Castell C, Ribas-Barba L, Méndez MA. Trends in the association between smoking history and general/central obesity in Catalonia, Spain (1992-2003). Nutr Hosp. 2017; 34: 102-110.

26) Dare S, Mackay DF, Pell JP. Relationship between smoking and obesity: a cross-sectional study of 499,504 middle-aged adults in the UK general population. PLoS One. 2015;10(4):e0123579.

27) Nead KG, Halterman JS, Kaczorowski JM, Auinger P, Weitzman M. Overweight children and adolescents: a risk group for iron deficiency. Pediatrics 2004;114:104-108.

28) Ausk KJ, Ioannou GN. Is obesity associated with anemia of chronic disease? A population-based study. Obesity 2008; 16: 2356-2361.

29) İsmail Hamdi Kara, Davut Baltacı, Sultan Sayın, Aylin Yılmaz, Ahmet Çeler, Mehmet Serkan Karaçam, Ramazan Memişoğulları, Yasemin Korkut. Üreme Çağındaki Obez Kadınlarda Hematolojik ve Biyokimyasal Parametrelerin İncelenmesi. Konuralp Tıp Dergisi 2012;4(1):1-7.

30) Marzullo P, Minocci A, Tagliaferri MA, Guzzaloni G, Di Blasio A, De Medici C, et al. Investigations of Thyroid Hormones and Antibodies in Obesity: Leptin Levels Are Associated with Thyroid Autoimmunity Independent of Bioanthropometric, Hormonal, and Weight-Related Determinants. The Journal of Clinical Endocrinology & Metabolism 2010; 95: 3965-72.

31) Nyrnes A, Jorde R, Sundsfjord J. Serum TSH is positively associated with BMI. Int J Obes (Lond) 2006; 30: 100-5.

32) Tagliaferri M, Berselli ME, Calò G, Minocci A, Savia G, Petroni ML, et al. Subclinical hypothyroidism in obese patients: Relation to resting energy expenditure, serum leptin, body composition, and lipid profile. Obes Res 2001; 9: 196-201.

33) Knudsen N, Laurberg P, Rasmussen LB. Small differences in thyroid function may be important for body mass index and the occurrence of obesity in the population. J Clin Endocrinol Metab. 2005; 90: 4019-24.

34) Müderrisoğlu C, Ülgen E, Altunoğlu E, Erdenen F, Boz M. Obesity and Thyroid Functions. İstanbul Tıp Dergisi 2009; 1: 24-25.

35) Lutsey PL, Steffen LM, Stevens J. Dietary intake and the development of the metabolic syndrome: the Atherosclerosis Risk in Communities Study. Circulation. 2008; 117: 754-761.

36) Yıldız E. Sağlık Bakanlığı Temel Sağlık Hizmetleri Genel Müdürlüğü. Obezite ve Tip 2 diyabet. Sağlık Bakanlığı Yayın No: 729. Klasmat Matbaacılık, Ankara, 2008. s. 9-11.

37) Robinson S, Kiddy D, Gelding SV, Willis D, Niththyananthan R, Bush A, et al. The relationship of insulin insensitivity to menstrual pattern in women with hyperandrogenism and polycystic ovaries. Clin Endocrinol (Oxf) 1993; 39: 351-355.

38) Speroff L, Class RH, Kase NG. Clinical Gynecologic Endocrinology and Infertility. 7. th ed, Williams and Wilkins, Philadelphia 2005; 78: 465- 491.

39) Holick MF. Sunlight and vitamin D for bone health and prevention of autoimmune diseases, cancers, and cardiovascular disease. Am J Clin Nutr 2004;80(Suppl 6):1678-1688.

40) Hekimsoy Z, Dinç G, Kafesçiler S, et al. Vitamin D status among adults in the Aegean region of Turkey. BMC Public Health 2010;10:782.

41) Ortega RM, Aparicio A, Rodríguez-Rodríguez E, et al. Preliminary data about the influence of vitamin D status on the loss of body fat in young overweight/obese women following two types of hypocaloric diet. Br J Nutr 2008;100:269-72.

42) Konradsen S, Ag H, Lindberg F, Hexeberg S, Jorde R. Serum 1,25-dihydroxy vitamin D is inversely associated with body mass index. Eur J Nutr 2008;47:87.

43) Liel Y, Ulmer E, Shary J, Hollis BW, Bell NH. Low circulating vitamin D in obesity. Calcif Tissue Int 1988;43:199-201.

44) Wortsman J, Matsuoka LY, Chen TC, Lu Z, Holick MF. Decreased bioavailability of vitamin D in obesity. Am J Clin Nutr 2000;72:690-693