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# The comparison of menarcheal age with familial pattern and body mass index

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**Abstract:** Aim: Investigating the menarcheal age and the factors affecting the menarcheal age in girls living in Kağıthane region. Methods: After the ethical approval was obtained, the survey –I was conducted among 500 girls aged 9-18 who were admitted to Kağıthane State Hospital for various illnesses. NCSS (Number Cruncher Statistical System) 2007&PASS (Power Analysis and Sample Size) 2008 Statistical Software (Utah, USA) Program were used. When evaluating the study data in addition to the descriptive statistical methods, Pearson Correlation Test was used regarding the menstruation age and the relevant relations. The significance was evaluated at  $p < 0.05$  level. Findings: In our study of menarcheal age, the mean of participants' menarcheal age was  $12.84 \pm 1.21$  years. When the relation between the participants' and their mothers' menarcheal age was analyzed, a statistically significant positive correlation was found ( $r = 0.389$ ;  $p < 0.01$ ). There was no statistically significant relation between the participants' menarcheal age and the body mass index levels ( $p > 0.05$ ). Discussion: A significant positive relation was found between mean menarcheal age of girls in Kağıthane region and the mean menarcheal age of their mothers. No relation between amenorrhea, dysmenorrhea, premenstrual syndrome, menorrhagia, menometrorrhagia body mass index and the early menarcheal age, was seen. However, the shift of menarche age to earlier age observed in previous studies was seen to be related to obesity, osteoporosis and to cancer. Thus, further detailed studies are needed to be conducted regarding the shift of menarcheal age to earlier years.

**Keywords:** Menarche, Early Menarche, Puberty

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## 1. Introduction

Menarcheal age is an important turning point in a woman's life. There are various factors changing the menarcheal age. Genetic and environmental factors can be included in these factors. In studies conducted, change in socioeconomic status, nutrition and increase in weight and body mass index (BMI) due to diet imbalance affect the menarcheal age<sup>(1,7)</sup>.

Menarcheal age has decreased due to improvement of the socio-economic conditions in 20th century, and the development of industrialization<sup>(2)</sup>. The decrease in menarcheal age let us face health problems and parallel to present studies, we conducted a study with girls living in Kağıthane region of mega city Istanbul, investigating the factors affecting their menarcheal age, and the problems faced during menarcheal age.

## 2. Method

The ethical approval was obtained in July 13, 2010 with no: 121 from Sisli Etfal Teaching and Research Hospital for the study to be conducted regarding the familial and BMI relationship with menarcheal age in girls aged 9-18 admitted to Kağıthane State Hospital for various illnesses. A survey at table-X was done with 500 girls aged 9-18 who had been admitted to Kağıthane State Hospital between August 2010-May 2011 in order to analyze the menarcheal age, factors affecting the menarcheal age and the frequent menstrual irregularities in our region.

In our study NCSS (Number Cruncher Statistical System) 2007&PASS (Power Analysis and Sample Size) 2008 Statistical Software (Utah, USA) program were used. When

evaluating study data (Mean Standard deviation, frequency) in addition to the descriptive statistical methods, Pearson Correlation Test was used regarding the menstruation age and the relevant relations. The significance was evaluated at  $p < 0.05$  level.

*Survey-I. Questionnaire for Menarcheal Age of Girls in Turkey*

Name Surname	Signature
1	The Name of the School
2	Class
3	Name Surname
4	Present Age
5	Height
6	Weight
7	Menarche Age
8	Mother's Menarche Age
9	First Sibling's Menarche Age
10	Second Sibling's Menarche Age
11	Education Level of Parents
12	Age of Telarche
13	Age of Pubarche
14	Duration of Any Accompanying Chronic Disease
15	Medical Drug Usage
16	Is there Amenorrhea
17	If Amonerrhea is Present, is it Primary or Secondary
18	Painful Menses History
19	Heavy Menstrual Bleeding
20	A Cyclic Heavy Vaginal Bleeding History
21	Premenstrual Tension History

I Participate This Study With My Own Consent Aimed To Determine Menarcheal Age

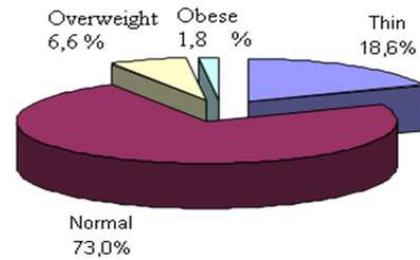
### 3. Findings

The study is undertaken with 500 adolescent girls who had applied to Kagithane State Hospital for various illnesses between August 2010-May 2011. Age distribution was 11-18 and the mean age was  $15.59 \pm 1.79$ . Distributions related to other descriptive characteristics are at Table 1.

*Table 1. Distribution of descriptive characteristics.*

	Min-Max	Mean±SD
Age (year)	11-18	15,59±1,79
Height (cm)	140-180	159,83±7,01
Weight (kg)	30-100	53,58±8,41
Body Mass Index (kg/height <sup>2</sup> )	15,31-36,73	20,96±2,79
	n	%

Height of subjects was between 140-180 cm with mean  $159.83 \pm 7.01$  cm; and the weight between 30-100 kg with a mean  $53.58 \pm 8.41$  kg. The Body Mass Index was between 15.31 and 36.73 with mean of  $20.96 \pm 2.79$ . When distribution according to Body Mass Index was evaluated, 18.6 % was found to be thin, 73 % normal, 6.6 % overweight and 1.8 % obese (Figure 1).



*Figure 1. Distribution graph of BMI levels*

The subjects' menarche age changed between 9-16 and the mean age was  $12.84 \pm 1.21$ . Their mother's age menarche age was between 8-20 and the mean age was  $13.17 \pm 1.52$ . Sister's mean menarche age of 170 cases (34%) was  $13.01 \pm 1.38$ . Fifty five subjects (11%) with two sisters had mean menarche age of  $13.07 \pm 1.39$ . Subjects' breast development age was 7-16 and the mean was  $11.95 \pm 1.36$ . The hairing age was 7-16 and the mean was  $12.05 \pm 1.39$  (Table 2).

*Table 2. Distribution according to menarcheal period.*

	Min-Max	Mean±SD
Menarche age	9-16	12,84± 1,21
Mother's menarche age	8-20	13,17± 1,52
First sister's menarche age	9-18	13,01± 1,38
Second sister's menarche age	10-16	13,07± 1,39
Breast development age	7-16	11,95± 1,36
Hairing age	7-16	12,05± 1,39
	n	%

When mothers' education level was analyzed we found that 2 % was illiterate, 58,2 % finished primary school, 15,6 % finished junior high school, 19 % finished 19 % senior high school, 1 % finished community and 4.2 % finished undergraduate school (Table 3).

When distribution according to father education level was analyzed, we found that 0,6 % was illiterate, 54,8 % finished primary school, 16 % finished junior high school, 20,8 % finished senior high school, 12.2 % finished community college and 6,4 % finished undergraduate school (Table 3).

*Table 3. Distribution according to parents' educational level.*

	n	%	
Mother's Education	Illiterate	10	2,0
	Primary School	291	58,2
	Junior High School	78	15,6
	Senior High School	95	19,0
	Community College	5	1,0
	Undergraduate	21	4,2
Father's Education	Illiterate	3	0,6
	Primary School	274	54,8
	Junior High School	80	16,0
	Senior High School	104	20,8
	Community College	7	1,2
	Undergraduate	32	6,4

Chronic diseases were present in 6.6% of cases (n=33); use of medication was seen in 3.2% of cases (n=6). Amenorrhea was present in 9.2 % (n=46), dysmenorrhea in 62.6% (n=313), menorrhagia in 21.8 % (n=109) and menometrorrhagia in

26.6% (n=133). Premenstrual syndrome was observed in 55.2% of cases (n=276) (Figure 2).

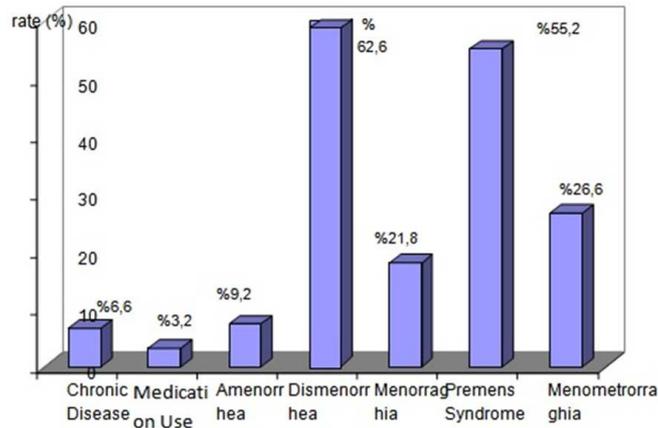


Figure 2. The graph of distribution of chronic disease, medication use, amenorrhea

dysmenorrhea, menorrhagia, premenstrual syndrome, menometrorrhagia

There was statistically significant positive correlation between subjects' menarche age and their mothers' menarche age ( $r = 0.389$ ;  $p < 0.01$ ) (Table 4).

Table 4. Evaluation of the relation between the subjects' menarche age and their mother's and sister's menarche age.

	Subject's menarche age	
	r	p
Mother's menarche age	0,389	0,001**
First sister's menarche age	0,402	0,001**
Second sister's menarche age	0,070	0,612
BMI	-0,002	0,964

Pearson correlation coefficient \*\* $p < 0,01$

There was a statistically significant positive correlation between the subjects' menarche age and the first sisters' menarche age. ( $r = 0.402$ ;  $p < 0.01$ ) (Figure 3 and Table 4).

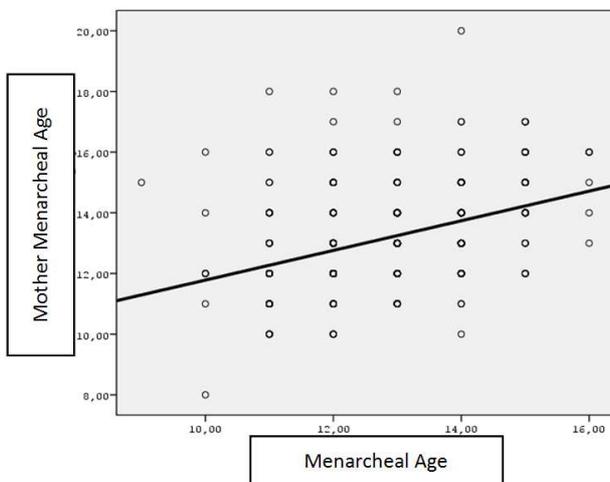


Figure 3. The relation between subject's menarche age and the mother's menarche age.

There was no statistically significant relation between the subjects and the subjects' second sisters' menarche age. ( $p > 0.05$ ) (Table 4 and Figure 4)

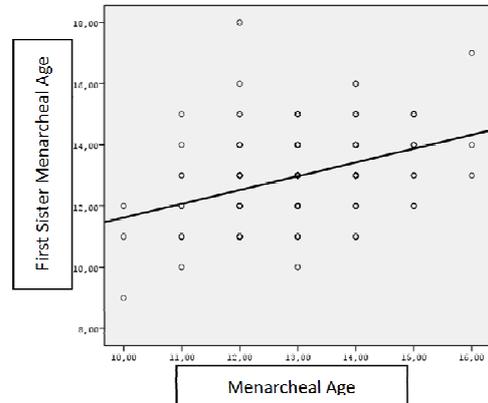


Figure 4. The relation between the subject's menarche age and the sisters' menarche age.

There was no statistically significant relation between the subjects' age and BMI levels. ( $p > 0.05$ ) (Table 4).

There was no statistically significant relation between menarche age according to parent's educational levels ( $p > 0,05$ ) (Table 5).

Table 5. Menarche age evaluation according to parent's Educational Status.

Menarche age		Mean±SD	p
Mother's educational level	Primary school and under	12,83± 1,24	0,825
	Junior high School	12,96± 1,24	
	Senior High school	12,80± 1,15	
	Community College +University	12,81± 0,94	
Father's educational level	Primary school and under	12,86± 1,27	0,905
	Junior high School	12,87± 1,18	
	Senior High school	12,79± 1,13	
	Community College +University	12,77± 1,04	

Oneway ANOVA test is used.

There was no statistically significant difference between the menarche ages according to incidence of amenorrhea, dysmenorrhea, menorrhagia and premenstrual syndrome ( $p > 0.05$ ) (Table 6).

Table 6. The evaluation of menarche age according to incidence of amenorrhea, dysmenorrhea, menometrorrhagia and premenstrual syndrome.

Menarche age		Mean± SD	p
Amenorrhea	Present	12,97± 1,23	0,437
	Not present	12,83± 1,21	
Dysmenorrhea	Present	12,80± 1,17	0,329
	Not present	12,91± 1,27	
Menorrhagia	Present	13,02±1,26	0,077
	Not present	12,79±1,19	
Premenstrual syndrome	Present	12,86±1,22	0,730
	Not present	12,85±1,20	
Menometrorrhagia	Present	12,87±1,25	0,771
	Not present	12,83±1,19	

Student t test was used.

## 4. Discussion

The puberty which is a transition period from childhood to adulthood through the process of growth and development, is characterized by biological, psychological and social changes in an individual's life. Puberty is closely related to climate, ethnic background, social status, urban or rural residence, physical activity, education, sexual arousal, housing, genetics and health<sup>(2)</sup>. Improvement of socioeconomic conditions and the increase of industrialized population through 20th century lead to a decrease in menarche age<sup>(3)</sup>.

Recent studies show that puberty starts 6 months - 1 year earlier in the last 50-60 years<sup>(4)</sup>. Menarche is the most important variable of the puberty period. Retrospective studies show that menarche age has shifted from 16,8 to 12,7 in South Korea when 1920 and 1986 born individuals were compared<sup>(5)</sup> and the menarche age 13,07 of woman born in 1920 in Brazil, has shifted to 12,4 with woman born in 1970<sup>(6)</sup>.

The study conducted in Ankara in 1970 showed mean menarche age as 14,01 and another study also conducted in Ankara in 1972 showed mean age of menarche as 14.57<sup>(7)</sup>. The mean menarche age of girls of high socio-economic level born in Istanbul during 1955-1960 was found to be 12.4±0.1<sup>(8)</sup>. The first data of puberty study regarding children of high socioeconomic level born in 1975-1980 did not show significant difference in the previous findings<sup>(9)</sup>. In the study by Neyzi and Onat with children of low socio-economic level, the mean menarche age was found to be 0,8-0,9 year ahead of the group of high socioeconomic status<sup>(10,11)</sup>.

The recent studies show that the menarche age 12.9±1,3 after comparison of high and low socioeconomic groups revealed no significant difference<sup>(12,24)</sup>.

Some studies revealed the fact that the mean menarche age in our country has not considerably changed in the last 30-40 years as in other countries. Countries in the world showed that menarche mean age has shifted to earlier years<sup>(13,3)</sup>.

The shift to earlier menarche age can be related to improvement in children's nutrition, effective coping with the infections, and growing up in better conditions<sup>(3)</sup>.

The menarche age is important with respect to indicating the society's biosocial status, and is affected by ecology, biological and social factors<sup>(14,15)</sup>. However, we can not ignore the effect of genetic characteristics on menarche age. Some studies show that menarche age was related to mothers' and sisters' mean menarche age<sup>(7,16,17)</sup>. In some studies, when mothers' and sister's mean menarche age ratios were analyzed, significant decrease was observed<sup>(18)</sup>. In our study, we analyzed and found the relation between the mothers' and sisters' menarche age and that of our subjects'. This revealed the fact that the genetic factors affect the menarche age.

When socioeconomic status which is one of the factors affecting the menarche age, was considered, no significant difference was observed between socioeconomic status and menarche age in studies supporting our study<sup>(3,12)</sup> although some studies showed earlier menarche age of girls from low

socioeconomic status versus the high socioeconomic status<sup>(7,18)</sup>. We cannot ignore the fact that our result is due to little difference in socioeconomic status considering our environment.

In various studies, menarche age was thought to shift to earlier years due to eating habits<sup>(15,19,20)</sup>. In our study, the relation between body mass index and menarche age is analyzed and no significant difference was observed.

A relation between early menarche age and dysmenorrhea was observed<sup>(21)</sup>. In our study, the relation between menarche age, amenorrhea, dysmenorrhea, menorrhagia, menometrorrhagia and premenstrual syndrome was analyzed and no significant relation was determined.

In our study we emphasized on the shift of menarche age to earlier years. The importance of early menarche age was that, one year of retardation of menarche age reduced the breast cancer risk by 5 %. Endometrial cancer was more frequent in those with early menarche age which is a predictor of obesity<sup>(22,23,)</sup>. The decrease in menarcheal age made us face cardiovascular problems, osteoporosis, fracture risk and primarily the breast cancer<sup>(2,25)</sup>. In addition to these problems, depression, anxiety, increase in aggression in girls who are not expecting early puberty, cannot be ignored<sup>(2)</sup>. Our study results as in other studies, showed us that menarche age was fixed for 30-40 years and that further new and comprehensive studies are needed to analyze the risk of new health problems due to early menarche age.

This study was conducted on 500 girls, appropriate statistical software was used. Sample size was adequate for statistical analysis. This regional study may not correctly reflect country's general population. Further, comprehensive and detailed studies are needed.

## References

- [1] Hopfe-Danker H. Menarcheal Age in Europe. *American Journal of Physical Anthropology* 1986;29:81-112.
- [2] Olga Karapanou ,Anastasio Papadimitriou . *Determinants of Menarche. Reprod Biol. Endocrinol.* 2010;8:1-10.
- [3] Nurçin H Saka ,Olçay Neyzi . Puberte Başlangıç Yaşı Değişiyor Mu. *Türk Pediatri Arşivi* 2005;40:7-14
- [4] MacMahon B. Age at menarche: United States, 1973. Rockville, MD : *National Center for Health Statistics; DHEW publication (HRA)* 1974; 74: 1615.
- [5] Hwang JY, Shin C, Frongillo EA, Shin KR,Jo I. Secular trend in age at menarche for South Korean woman born between 1920 and 1986: *the Ansan Study Ann Hum Biol* 2003; 30: 434-42.
- [6] Kac G Coel, Velasquez. Melendez G. Secular trend in age at menarche for women born between 1920 and 1979 in Rio de Janeiro, Brazil. *Ann Hum Biol* 2000; 27: 423- 8.
- [7] Nurver Turfaner. İstanbul Fatih Bölgesinde Menarş Yaşını Etkileyen Faktörler. *İstanbul.Nobel Med* 2010;6:2024
- [8] Olçay Neyzi , Alp H, Orhon A. Sexual maturation in Turkish girls. *Ann Hum Biol* 1975; 2: 49- 59.

- [9] Bundak R, Neyzi O, Balaban S, et al. Secular trend in sexual maturation in Turkish girls of high socioeconomic class. 8 th International Congress of Auxology. *Human Growth and Development*. Philadelphia 1997, Abstract. p: 31.
- [10] Olcay Neyzi , Alp H. Ergenlik çağının özellikleri 1. (Ergenlik olayının değerlendirilmesi, İstanbul çocuklarında cinsel gelişme) *İstanbul Tıp Fakültesi Mecmuası* 1977; 40: 187- 215.
- [11] Onat T, Ertem B. İstanbul kız çocuklarında menarş, seksüel, kemik gelişmesi ve menarş yaşının fiziksel, seksüel ve kemik gelişimi tempoları ve sosyoekonomik seviye ile ilişkileri. *Cerrahpaşa Tıp Fak. Derg* 1974;5:1-17
- [12] Ersoy B, Balkan C, Günay T, et al. Effect of different socioeconomic conditions on menarche in Turkish female student. *Early Human Development*, 2004, 76: 115- 25.
- [13] Vicdan K, Kukner S, Dabakoglu T, et al. Demographic and epidemiologic features of female adolescents in Turkey. *J Adolesc Health* 1996; 18: 54-8.
- [14] Bielicki T, Welon Z. Growth data as indicators of social inequalities: the case of Poland. *Yearb Phys Antropol* 1982; 25:153-67.
- [15] Laksa-Mierzejewska T, Milicer H, Piechaczek H. Age at menarche and secular trend in urban and rural girls in Poland. *Ann Hum Biol* 1982; 9: 227-33.
- [16] Ersoy B, Balkan C, Gunay T, et al. The factors affecting the relation between the menarcheal age of mother and daughter. *Child Care Health Dev* 2005; 31: 303-8.
- [17] Papadimitriou A, Gousia E, Pitaouli E, et al. Age at menarche in Grek girls. *An Hum Biol* 1999; 26: 175-7.
- [18] Bumin Dünder ,Hülya Anıl ,Pınar Akyol ,Erdal Eren ,Nihal Dünder . Isparta'daki kız çocuklarında ortalama menarş yaşının ve menarşı etkileyen etmenlerin saptanması. *Türk Pediatri Arşivi* 2008;43: 50-54
- [19] Merzenich H, Boeing H, Wahrendorf J. Dietary fat and sports activity as determinants for age at menarche. *American Journal of Epidemiology* 1993, 138: 110-14.
- [20] Boldsen JL. Season of birth and recalled age at menarche. *JBios Sci* 1992; 24: 167-73.
- [21] Latthe P, Mignini L, Gray R, Hills R, Khan K. Factors predisposing women to chronic pelvic pain. Systematic Review. *BMJ* 2006; 332: 749-55.
- [22] Trentham-Dietz A, Nichols HB, Hampton JM, Newcomb PA. Weight change and risk of endometrial cancer. *Int J Epidemiol*. 2006; 35 166-8
- [23] Modugno F, Ness RB, Chen C, Weiss NS. Inflammation and endometrial cancer: a hypothesis. *Cancer Epidemiol Biomarkers Prev*. 2005; 14: 2840-47.
- [24] Laitinen J, Power C, Jarvelin MR. Family social class, maternal body mass index, childhood body mass index and age at menarche as predictors of adult obesity. *Am J Clin Nutr*. 2001; 74: 287-94
- [25] Özaydın A, Güllüoğlu BM, Ünalan PC, et al. Bahçeşehir'de outran kadınların meme kanseri bilgi düzeyleri, bilgi kaynakları ve meme sağlığı ile ilgili uygulamaları. *The Journal of Breast Health* 2009; 5: 214-24