AGE AT MENARCHE IN ANKARA, TURKEY

Yener Bektas
Ankara University, Ankara, Turkey

Introduction

Menarche, the onset of the first menses, is an important maturity indicator in assessing the developmental status of a pubertal female (Cameron and Nadgdee, 1996). This biological event that appears to be a particularly sensitive indicator of the biosocial status of a population is the outcome of a number of social, ecological, and biological factors (Bielicki and Welon, 1982; Dann and Roberts, 1993; Padez, 2002; Vienna and Capucci, 1994). Socioeconomic status -nutrition, health care, living conditions- (Apraiz, 1999; Bodzsar, 1998; Sa´nchez-Andre´s, 1997; Simodon et al., 1997), geographic environment -temperature, altitude, humidity, seasonality- (Boldsen, 1992; Gonzales et al., 1996), genetic influences -ethnic group, family heredity, constitutional type- (Campbell and Udry, 1995; Loesch et al., 1995; Malina et al., 1997; Meyer et al., 1991; Treoloar and Martin, 1990) are may listed among these factors. Due to improvements in the general pattern of these factors, especially the ones concerning nutrition and health care, age at menarche in Europe, North America and other developed countries has shown a general downward trend (Eveleth and Tanner 1990).

In Turkey, a developing country, studies of menarche are limited. However, several unpublished manuscripts are available for a few cities based on selected and unrepresentative samples on this subject. The aim of the present study was to investigate the influence of some socioeconomic conditions; in particular, parents' educational level and occupation, family size on age at menarche of Turkish girls live in urban. The secular change in the body dimensions and age at menarche in Ankara during the 20th century was also analyzed.

Material and Methods

Sample
A cross-sectional anthropometric survey was carried out in two primary, two secondary and two high schools of Ankara, the capital of Turkey. These schools were selected randomly among all the schools in Ankara; all of them were located in the urban centre of Ankara. The urban centre is similar to that in an industrialized country, i.e. formed by concrete buildings and served by electricity and water systems.

Social and Anthropometric Data
Categorization of socioeconomic class was based on the occupation and education of the parents by applying the Hollingshead index. Six educational levels and six occupational categories were used to identify socioeconomic classes. A score of 1 was given to the lowest level of education and occupation, and a score of 6 was given to the highest. Hollingshead scoring was modified according to national Turkish standards. Three socioeconomic classes were identified, as low, medium and high, on the basis of the sum of scores.

A total of 400 girls, aged between 10 and 17 years, were examined. Height and weight were measured according to the International Biological Programme (Weiner and Lourie, 1969) and Anthropometric Standardization Reference Manual (Lohman et al., 1988). Each student was measured without shoes and wearing light-weight clothes. Height was measured to the nearest millimeter and weight was recorded to the nearest 100 g. Body mass index was calculated with height and weight: Body Mass Index = weight/height^2.

The girls were subjected to a personal questionnaire relative to their menstruation. The 'status quo' method was used to estimate mean age at menarche (Rusbach et al., 1962). Each girl was asked whether they had or not started menstruation, always by the same well-trained technician.

Statistical analysis
Probit analysis (Finney, 1971) was performed to estimate mean age at menarche using the probit procedure of SPSS 13.0 package. The probit procedure calculates maximum likelihood estimates of regression parameters of the percentage of menstruating girls; from these parameters are derived estimations of mean age at menarche, standard error and the standard deviation in the sample. The analysis was made using the exact ages, from the last half year age group with 0% of mature girls to the first half year age group with 100% of mature girls.

Between-group differences in age at menarche were compared by means of one-way analysis of variance and the existence of secular trends was examined by means of linear regression analysis using SPSS package.

Results

The ages of the girls involved in the study ranged between 10 and 17 years, with a mean of 13.8±2.3 years. In this study, we found that the mean height 157.7±8.6 cm and the mean weight was 51.1±10.2 kg. The mean BMI was 20.4±2.9 kg/m^2.

Table 1 summarizes some of the family characteristics of each girl. Concerning parents' educational and occupational statuses, most of the fathers had university training (54.0%), of the mothers had high school training (40.1%), and most of the fathers had administrative and related workers (49.7%), of the mothers had housewife (55.1%). When the structure of families was evaluated, it was found that most of them had two children (53.5%). Only 0.21% of the families had four and more children.

Table1. Socioeconomic Characteristics of the Sample.

Socioeconomic characteristics	Number	Percent	Score
Fathers' education			
Postgraduate	8	2.1	6
University	203	54.0	5
High school	112	29.9	4
Secondary school	38	39.9	3
Primary school	15	4.0	2
No education	-	-	1
Mothers' education			
Postgraduate	-	-	6
University	127	33.2	5
High school	153	40.1	4
Secondary school	55	14.4	3
Primary school	41	10.7	2
No education	-	-	1
Fathers' occupation			
Higher executives of large concerns, proprietors, and major professionals	72	19.2	6
Business managers, proprietors of medium-sized businesses, and lesser professionals	187	49.7	5
Administrative personnel, owners of small businesses, and minor professionals	82	21.8	4
Unskilled workers	15	4.0	3
Retired	20	5.3	2
No occupation	-	-	1
Mothers' occupation			
Higher executives of large concerns, proprietors, and major professionals	12	3.2	6
Business managers, proprietors of medium-sized businesses, and lesser professionals	73	19.4	5
Administrative personnel, owners of small businesses, and minor professionals	41	10.9	4
Unskilled workers	10	2.7	3
Retired	33	8.8	2
Housewife	207	55.1	1
Total offspring			
1	56	14.9	5
2	201	53.5	4
3	96	25.5	3
4	22	5.9	2
5 ≥	1	0.3	1

Table 2 presents the number and the proportion of menstruating girls at every 1 year interval after fitting a probit model. A test of goodness of fit confirmed the appropriateness of the probit model employed. The youngest girl menstruating in Ankara was 10.84 years old, and the oldest non-menstruating one was 15.35 years old. Mean (SD) of age at menarche based on probit model was then estimated as 12.42 (±1.04) years with 95% confidence intervals (95% CI: 12.19-12.65).

Table2. Number (%) of menstruating girls at every one year interval after fitting a probit model.

Age group*	Total number	Number of menstruating	Percent of Menstruating
10	39	1	2.6
11	47	3	6.4
12	44	15	36.4
13	56	44	80.4
14	42	36	85.7
15	55	54	98.2
16	42	42	100.0
17	51	51	100.0

*Age groups 10, 11, etc. signify 9.49-10.50, 10.51-11.49, etc., respectively.
$\chi^2 = 7.8$, d.f. = 6, p=0.251 (non significant).

Consideration of the overall results of this investigation leads one to conclude that even relatively small socioeconomic differences exert a delaying influence on the age at menarche. Both anthropometric measurements and menarche are influenced by environmental factors such as education and occupation, among many other variables. Menarcheal age of girls in high socioeconomic class was one of the earliest reported in our sample (Table 3, Fig. 1).

Table3. Age at Menarche in Total Sample According to the Socioeconomic Status (SES).

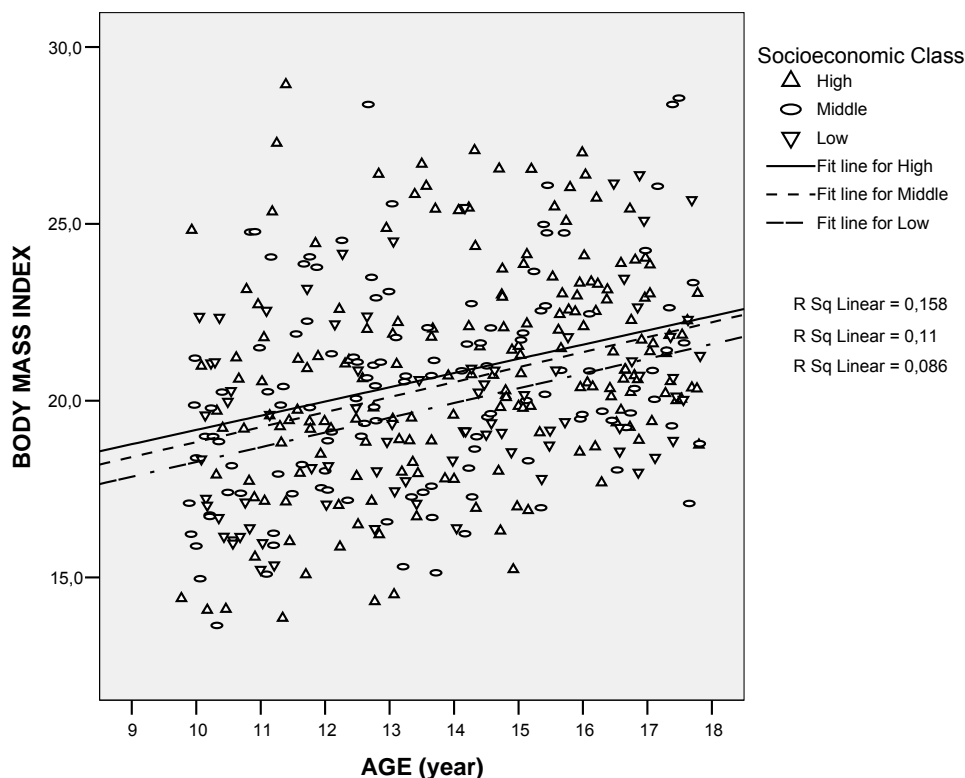| SES	N	Mean	SE	χ^2	d.f.	p
High	186	12.38	0.15	2.7	6	0.845
Medium	128	12.53	0.11	5.8	6	0.449
Low	82	12.70	0.25	12.0	6	0.061

Figure1: Body Mass Index Values of Turkish Girls According to the Socioeconomic Status (SES).

There is a statistically significant differences in anthropometric characteristics between menstruating and non-menstruating girls' in all sample (p<0.001). However, concerning of same age group menstruating girls' anthropometric measurements are higher than non-menstruating girls in all age groups (Table 4).

Table4. Comparisons of anthropometric characteristics by menstruating status.

Age Group	Menstruating Status	N	Height (cm)	S.D.	Weight (kg)	S.D.	BMI (kg/m^2)	S.D.
10	Nonmenstruating	39	141.6	5.4	36.9	7.8	18.35	2.6
	Menstruating	0	-	-	-	-	-	-
11	Nonmenstruating	44	149.7	7.3	42.5	9.6	18.89	3.2
	Menstruating	3	151.1	3.6	55.2	4.2	24.90	2.4
12	Nonmenstruating	29	155.0	4.8	47.8	7.1	19.90	2.7
	Menstruating	15	157.7	5.0	50.6	6.4	20.42	1.8
13	Nonmenstruating	12	156.2	4.4	46.7	11.4	19.06	4.2
	Menstruating	44	158.2	5.6	51.0	4.6	20.38	2.5
14	Nonmenstruating	6	159.1	3.1	43.1	4.8	16.99	1.4
	Menstruating	36	161.6	5.2	55.5	8.1	21.26	2.9
15	Nonmenstruating	1	163.9	-	47.9	-	16.97	-
	Menstruating	54	164.0	4.9	56.2	7.0	20.89	2.6
16	Nonmenstruating	0	-	-	-	-	-	-
	Menstruating	42	164.0	4.3	59.1	6.3	22.08	2.2
17	Nonmenstruating	0	-	-	-	-	-	-
	Menstruating	51	164.1	4.9	56.9	6.0	21.22	2.2

Discussion

Age at first menstruation has shown a decreasing secular trend in many populations. In the USA, the mean age at menarche decreased from >14 years prior to 1900 (Wyshak and Frisch 1982) to <12.5 years at present (Chumlea et al. 2003). Scandinavian studies demonstrated a trend towards a younger age at menarche during the second half of the 20th century (Helm and Helm 1984), and also in Israel mean age at menarche decreased over time from 13.41±1.30 years for women born prior to 1970 to 13.03±1.28 years for those born post 1978 (Chodick et al. 2005).

Few studies in Turkey have assessed age at menarche, and these have shown a great deal variability in the timing of this event. The mean menarcheal age in the Ankara, calculated by probit analysis was 12.42 (±1.04) years in the present study. Concerning to studies on age at menarche in Ankara, mean age at menarche has varied from 12.4 years (Bektaş, 2004) to 14.6 years (Egemen, 1972; Table5).

In many countries, urbanization is also connected to lifestyle. Generally, the percentage of persons with higher education and high level of Professional skills is greater in urban than rural populations. Numerous studies showed that socioeconomic variability between urban and rural populations is caused differences in sexual maturation. In the present study, our findings are similar the other studies (Table 5).

Table 5. Comparison of mean age at menarche in Ankara

Author	Location	Mean
Bayçu and Kocatürk, 1967[1]	Urban	13.3
Akın, 1970[1]	Rural	14.0
Egemen, 1972[1]	Rural	14.6
Yarar, 1994[1]	Urban	13.0
Bektaş, 2004[2]	Urban	12.4

[1]Years, recalled ages; [2]recalculated by probits

Table 5 summarizes studies on age at menarche in Ankara. The changes in age at menarche among the Turkish girls are likely related to improvements in the health and nutritional situation of these populations through the second half of the last century, as Turkey experienced significant improvement in living standards, e.g., those related to education and health care, during this period (Bektaş, 2006; TURKSTAT, 2000).

We evaluated whether the age at menarche was affected by different socioeconomic status in adolescent girls who live in urban area. Urban girls were menstruating significantly earlier than the girls living in rural areas in Ankara. From our results we can conclude that the girls from families with high socio-economic status experience menarche at an earlier age than girls from families with lower socioeconomic status. However, socioeconomic status dependent disparities in menarcheal age were smaller in the population of big cities in comparison to smaller towns and rural areas. This phenomenon might be due to differences in the standard of living.

In summary, this work reports the first estimate of age at menarche in Turkish populations as well as an evaluation of the secular changes that have occurred in this physiological variable over a 37-year span. A significant change in age at menarche toward earlier menarcheal age in the past 37 years in this population is shown. This indicates that, despite the negative effect of environment in which they live, there has been general improvement in overall socioeconomic conditions in Turkey.

References

Akın A., 1970, An epidemiological study of gynecological complaints and diseases and their causes. In the Rural Areas of Ergazi Health Centre. Abstracts of Research on Family Planning and Fertility (1970-1986) Edt: Tezcan, S. et al. H.U. Publication No:87-41 Ankara 1990: 60-63

Apraiz AG. 1999. Influence of family size and birth order on menarcheal age of girls from Bibao City (Biscay, Basque Country). Am J Hum Biol 11: 779–783.

Bektaş, Y.; Akın, G., 2005, Ankara'da üst sosyoekonomik düzey 10-17 yaş grubu çocukların boy ve ağırlık değerleri, Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi Dergisi 45(1): 97-114.

Bielicki, T., and Welon, Z., 1982, Growth data as indicators of social inequalities: the case of Poland. Yearbook of Physical Anthropology, 25, 153–167.

Bodzsar E. 1998. Secular growth changes in Hungary. In: Bodzsa´r E, Susanne C, editors. Secular growth changes in Europe. Budapest: Eötvös University Press. p 175–205.

Boldsen JL. 1992. Season of birth and recalled age at menarche. J Bios Sci 24:167–173.

C. Padez Age at menarche of schoolgirls in Maputo, Mozambique, Annals of Human Biology 2003, 30:4 487–495

Cameron, N., and Nadgdee, I., 1996, Menarcheal age in two generations of South African Indians. Annals of Human Biology, 23, 113–119.

Campbell BC, Udry R. 1995. Stress and age at menarche on mothers and daughters. J Bios Sci 27:127–134.

Chodick G, Huerta M, Balicer RD, Davidovitch N, Grotto I. 2005. Secular trends in age at menarche, smoking, and oral contraceptive use among Israeli girls. Prev Chronic Dis 2:A12.

Chumlea WC, Schubert CM, Roche AF, Kulin HE, Lee PA, Himes JH, Sun SS. 2003. Age at menarche and racial comparisons in US girls. Pediatrics 111:110–113.

Dann, T. C., and Roberts, D. F., 1993, Menarcheal age in university of Warwick young women. Journal of Biosocial Science, 25, 531–538.

Egemen A., 1972, A study to determine the health status of married women in the 15-44 age category in Sincan. Abstracts of Research on Family Planning and Fertility (1970-1986) Edt: Tezcan, S. et al. H.U. Publication No:87-41 Ankara 1990: 64-69

Eveleth, P., and Tanner, J. M., 1990, Worldwide Variation in Human Growth (Cambridge: Cambridge University Press).

Finney, 1971, Probit Analysis (Cambridge: Cambridge University Press).

Gonzales GF, Villena A, Ubilluz M. 1996. Age at menarche in Peruvian girls at sea level and at high altitude: effect of ethnic background and socioeconomic status. Am J Hum Biol 8:457–463.

Helm P, Helm S. 1984. Decrease in menarcheal age from 1966 to 1983 in Denmark. Acta Obstet Gynecol Scand 63:633–635.

Hollingshead A. Two factor index of social position. New Heaven, USA: Yale Univ. Press; 1957.

Loesch DZ, Huggins R, Rogucka E, Hoang NH, Hopper JL. 1995. Genetic correlates of menarcheal age: a multivariate twin study. Ann Hum Biol 22:479–490.

Lohman TG, Roche AF, Martorel R, 1988, Anthropometric Standardization Reference Manual, Human Kinetics Books Champaign, Illinois.

Malina RM, Ryan RC, Bonci CM. 1997. Age at menarche in athletes and their mothers and sisters. Ann Hum Biol 21:417–422.

Meyer JM, Eaves LJ, Heath AC, Martin NG. 1991. Estimating genetic influences on the age-at menarche: a survival analysis approach. Am J Med No: 9, Oxford: Blackwell.

Pheasant, S., 2002. Bodyspace Anthropometry, ergonomics and the design of work. London: Taylor and Francis.

Rusbach HW, Van Laar, De Hass J, (1962) Age of menarche, status-quo correspondence and method of inquiry, Tijdschr Soc Geneeskd. May 11;40:294-6

Sa´nchez-Andre´s A. 1997. Genetic and environment factors affecting menarcheal age in Spanish women. Anthropol Anz 55:69–78.

Simodon KB, Simon Y, Simodon F. 1997. Nutritional status and age at menarche of Senegalese adolescents. Ann Hum Biol 24:521–532.

Treoloar SA,MartinNG. 1990. Age at menarche as a fitness trait: non-additive genetic variance detected in a large twin sample. Am J Hum Gen 47: 137–148.

Vienna, A., and Capucci, E., 1994, Menarcheal age in central Italy. American Journal of Human Biology, 6, 547–549.

Weiner, J.E.S., Lourie, J.A., 1969. Human Biology: A Guide to Field Methods. IBP Handbook, Genet 39:148–154.

Wyshak G, Frisch RE. 1982. Evidence for a secular trend in age of menarche. N Engl J Med 306:1033–1035.

Mailing address: Yener Bektas
                      Ankara University
                      06100 Sihhiye Ankara, Turkey
                      yener.bektas@humanity.ankara.edu.tr