

Age at Menarche in Ankara, Turkey

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Abstract: *Age at menarche is the most important characteristic of sexual maturation in girls and a sensitive indicator of environmental conditions during childhood. In Turkey, a developing country, studies of menarche are limited. The present study analyzed the association between age at menarche and socioeconomic characteristics (urbanization, education and occupation of parents). Questionnaire data were collected from 400 female schoolchildren, aged between 10 and 17 years, live in Ankara, capital of Turkey. Probit analysis was used to estimate median ages at menarche and 95% confidence intervals (CI) for the status quo data. The median age (and SE) at menarche is 12.48 ± 0.09 years (95% CI: 12.25–12.70 years). Girls from families with high socioeconomic status experience menarche at an earlier age than girls from families with lower socioeconomic status. In addition, we found that girls live in industrialized parts attained menarche earlier than in non-industrialized parts of Ankara. Depending on our results; we can conclude that the differences observed in socioeconomic status influence the age at menarche.*

Keywords: *Sexual maturation, Menarcheal age, Socioeconomic status, Turkish girls.*

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 (Bodzsár 1975, Bielicki and Welon 1982, Dann and Roberts 1993, Padez 2003a, Vienna and Capucci 1994). Socioeconomic status – nutrition, health care, living conditions – (Apraiz 1999, Sanchez-Andres 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, Zsákai and Bodzsár 2000) can be 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, Susanne and Bodzsár 1998, Malina et al. 2004).

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 (Akin 1970, Bayçu and Kocatürk 1967, Egemen, 1972, Onat and Ertem 1973, Yazar 1994).

The aim of the present study was to investigate the influence of some socioeconomic conditions; in particular, urbanization, parents' educational level and occupation on age at menarche of girls live in Ankara, capital of Turkey. The secular change in the 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 in 2004. 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 (Hollingshead 1957). Six educational levels and six occupational categories were used to identify socioeconomic classes. A score of 1 was given to the highest level of education and occupation, and a score of 6 was given to the lowest. 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. The first and second socioeconomic classes in Hollingshead scoring were defined as low, third and fourth classes were defined as medium, fifth class was defined as high socioeconomic class. Scores of 11–17 were called high class, 18–47 medium the class, and 48–66 lower class (Ersoy et al. 2004, Turkstat 2001).

A total of 400 girls, aged between 10 and 17 years, were examined. Height and weight were measured according to the International Biological Program (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 (BMI) was calculated.

The girls were subjected to a personal questionnaire relative to their menstruation. The status quo method was used to estimate median 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 median 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 menarcheal girls; from these parameters are derived estimations of median age at menarche and standard error (SE) in the sample. Between-group differences in age at menarche were studied by one-way analysis of variance using SPSS package.

Results

Table 1 summarizes some of the family characteristics of each girl. Concerning parents' educational and occupational statuses, most of the fathers had university training (53.8%), of the mothers had high school training (40.0%); and most of the fathers had administrative and related workers (49.7%), of the mothers had housewife (55.1%).

Table1. Scoring of the educational level and occupation of parents according to the Hollingshead index of socioeconomic groups.

Socioeconomic characteristics	N	%	Score
<i>Fathers' education</i>			
Postgraduate	9	2.2	1
University	215	53.8	2
High school	117	29.3	3
Secondary school	41	10.2	4
Primary school	18	4.5	5
No education	–	–	6
<i>Mothers' education</i>			
Postgraduate	–	–	1
University	140	35.0	2
High school	160	40.0	3
Secondary school	58	14.5	4
Primary school	42	10.5	5
No education	–	–	6
<i>Fathers' occupation</i>			
Higher executives of large concerns, proprietors, and major professionals	77	19.2	1
Business managers, proprietors of medium-sized businesses, and lesser professionals	199	49.7	2
Administrative personnel, owners of small businesses, and minor professionals	87	21.8	3
Unskilled workers	16	4.0	4
Retired	21	5.3	5
No occupation	–	–	6
<i>Mothers' occupation</i>			
Higher executives of large concerns, proprietors, and major professionals	13	3.2	1
Business managers, proprietors of medium-sized businesses, and lesser professionals	77	19.4	2
Administrative personnel, owners of small businesses, and minor professionals	44	10.9	3
Unskilled workers	11	2.7	4
Retired	35	8.8	5
Housewife	220	55.1	6

Educational and occupational scores of parents: 11–17: high; 18–47: medium; 48–66: low

Table 2 shows cumulative frequency of postmenarcheal girls. The youngest girl postmenarcheal in Ankara was 10.84 years old, and the oldest premenarcheal one was 15.35 years old. Median (and SE) of age at menarche based on probit model was then estimated as 12.48±0.09 years with 95% confidence intervals (95% CI: 12.25–12.70). The data used for probit analysis revealed that the distribution did not differ from the normal (Pearson $\chi^2 = 4.7$, df = 6, p=0.580).

Table 2. Frequency of menarcheal girls at every one year interval.

Age group*	Total number	Number of postmenarcheal	Percent of postmenarcheal
10	39	0	0
11	47	3	6.4
12	45	16	35.5
13	58	44	75.9
14	42	36	85.7
15	56	55	98.2
16	43	43	100.0
17	70	70	100.0

*Age groups 10, 11, etc. signify 9.50–10.49, 10.50–11.49, etc., respectively; $\chi^2 = 4.7$, d.f. = 6, $p=0.580$ (non significant)

The present study shows that menarche is influenced by environmental factors such as parent's education and occupation. From our results we can conclude that the girls from families with high socioeconomic status experience menarche at an earlier age than girls from families with lower socioeconomic status (Table3).

Table 3. Age at menarche in total sample according to the socioeconomic status (SES).

SES	N	Median	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	86	12.70	0.25	12.0	6	0.061

Figures 1–3 compares the anthropometric status according to menarcheal status. There are statistically significant differences in weight and value of BMI characteristics between pre and postmenarcheal girls: Height, weight and value of BMI in the postmenarcheal girls larger than premenarcheal girls of the same chronological age, while there were significant differences in weight for ages 13 ($p<0.05$), 14 ($p<0.001$) and in BMI for ages 11 ($p<0.05$), 13 ($p<0.05$) and 14 ($p<0.001$) only.

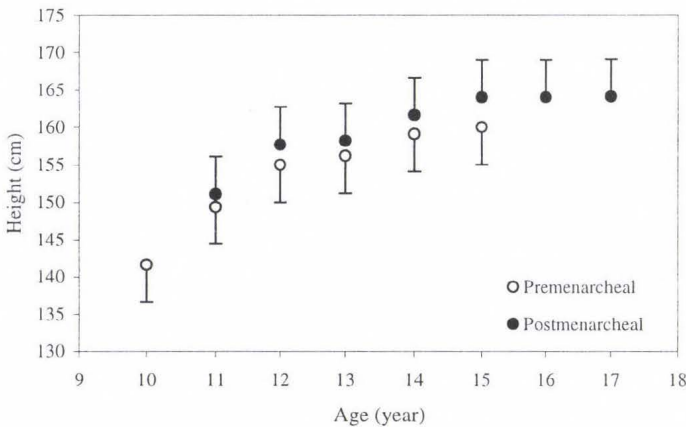


Figure 1: Mean and SE of body height by age in girls.

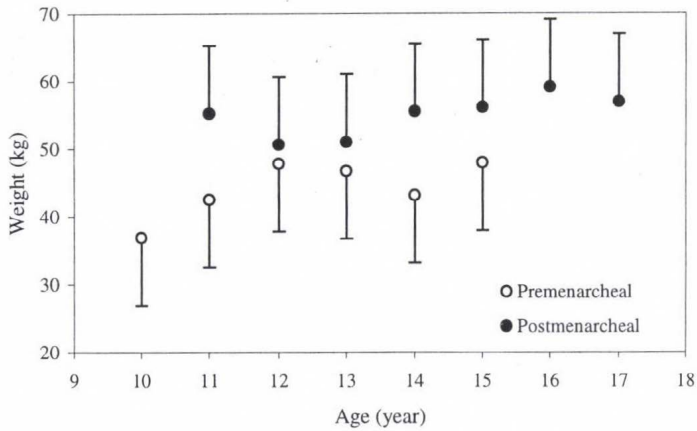


Figure 2: Mean and SE of body weight by age in girls.

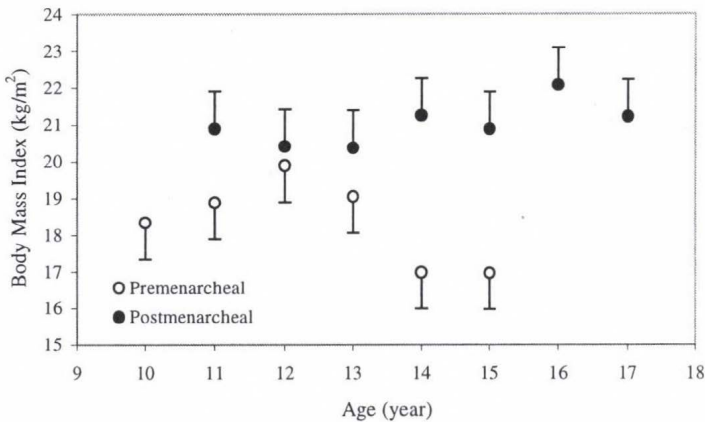


Figure 3: Mean and SE of BMI by age in girls.

Discussion

Studies of menarcheal age are limited in Turkey, especially by considering the socioeconomic status of girls. The comparison of menarcheal age of girls from different socioeconomic status could give important data not only to the Turkish auxological researches but to the database of epidemiological auxology and the international comparisons as well. The influence of socioeconomic factors and the influence of urban environments as well as the secular trend in 37 year long period were investigated in a sample of 10–17 years old girls live in Ankara.

The median menarcheal ages in Ankara girls in this study, calculated by probit analysis were 12.48 ± 0.09 years. It is difficult to compare these data with other European countries due to different methodologies and the different periods of the surveys. However, we were able to compare our data with other studies that took place in the 1960s or later in Ankara. Few studies in Ankara have assessed age at menarche, and these have shown a great deal variability in the timing of this event (Akin 1970, Bayçu and

Kocatürk 1967, Egemen 1972, Yazar 1994). Concerning to studies on age at menarche in industrialized and non-industrialized parts of Ankara, mean age at menarche has varied from 12.5 years (Bektaş 2004) to 14.6 years (Egemen 1972).

Body size factors, including height, weight and BMI, have long been found to be strongly associated with the onset of menarche (Bodzsár 2000, Buckler 1989). Many studies show that postmenarcheal girls have larger anthropometric measurements than premenarcheal girls (Acharya et al. 2006, Bodzsár 1975, 2000, Chang et al. 2000). The present study shows that the girls with earlier menarche were heavier and had the highest BMI (Figures 1–3).

The socioeconomic status, often given by the parents' educational level or occupation, showed some statistically significant effects—girls of lower social upbringing exhibited, on average, a delay in their first menstruation, when compared with girls from well-off families (Attallah et al. 1983, Bielicki et al. 1986, Henneberg and Louw 1995, Laska-Mierezejewska 1995, Padez and Rocha 2003). The present study also shows that there are significant differences in age at menarche between Ankara girls come from different socioeconomic status (Table 3). In other words, the changes in age at menarche between girls live in Ankara show that improvements in socioeconomic factors are still continuing in industrialized parts of Turkey. This phenomenon might be due to continuing migration or economical development in cities (Turkstat 2001).

Numerous studies showed that socioeconomic variability between industrialized and non-industrialized populations is caused differences in sexual maturation as well as the influence of degree of urbanization (Bielicki and Hulanicka 1998, Godina 1996, Hulanicka and Waliszko 1991, Susanne and Bodzsár 1998, Marrodan et al. 2000, Padez 2003a,b, Pasquet et al. 1999). In this study, similar to the other studies, we found that girls live in industrialized parts attained menarche earlier than in non-industrialized parts of Ankara (Table 4).

Table 4. Menarcheal age in Ankara girls.

Author	Location	Menarcheal age (yr)
Bayçu and Kocatürk 1967 ¹	Industrialized part	13.3
Akın 1970 ¹	Non-industrialized part	14.0
Egemen 1972 ¹	Non-industrialized part	14.6
Yazar 1994 ¹	Industrialized part	13.0
Bektaş 2004 ²	Industrialized part	12.5

¹Years, recalled ages (mean); ² recalculated by probits (median)

Age at menarche is probably the most reliable and also the best documented measure of maturation rate. In the first half of the 20th century intense secular trend was noticed in age at menarche all over Europe (Tanner 1962, 1978, Bodzsár and Susanne 1998). However, this general trend has apparently stopped in some regions of United Kingdom (Dann and Roberts 1973), Brussels and Leuven of Belgium (Vercauteren and Susanne 1975, Wellens et al. 1990), Germany (Richter 1973, 1979, 1982), Norway (Brundtland and Walloe 1973), Russia (Godina 1998), Hungary (Bodzsár and Zsákai 2007), Croatia (Prebeg 1984), Italy (Martuzzi Veronesi and Guerresi 1994) and Iceland (Tryggvadottir et al. 1994). From these studies it seems that age at menarche is still decreasing in many countries, but has stayed unchanged or reversed its trend in others (Bielicki and Hulanicka 1998, Rebato 1998). In this study, the current menarcheal age in girls live in

Ankara is among the lowest found in Ankara. Downward shifts in menarcheal age in industrialized parts of Ankara also observed between 1967 and 2004 as well (Table 4).

We evaluated whether the age at menarche was affected by different socioeconomic status in adolescent girls live in industrialized part of Ankara. The present study shows that there are significant differences in age at menarche between girls come from different socioeconomic status. In addition, we found that girls live in industrialized parts attained menarche earlier than in non-industrialized parts of Ankara. Consideration of the results of this investigation leads one to conclude that even relatively small socioeconomic differences exert a delaying influence on the age at menarche. In Turkey, as a developing country, urbanization is still growing rapidly and future studies are needed to evaluate its long-term impact on the biology of human populations.

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