

# Pubertal Development of Eastern Turkish Girls in Elazığ

## ELAZIĞ'DA DOĞU ANADOLU KIZ ÇOCUKLARININ PUBERTAL GELİŞİMİ

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### Summary

Data on pubertal development in 498 healthy, well developed school girls from cross-sectional study in Elazığ, Eastern Turkey are reported. Breast and pubic hair development are classified according to Marshall and Tanner, and Winter criteria. The initiation of breast development (the onset of puberty) was  $11.4 \pm 0.23$  (mean  $\pm$  SEM) years, that of pubic hair development was  $13.0 \pm 0.21$  years and that of the occurrence of menarche was  $13.0 \pm 0.10$  years. The completion of breast and pubic hair development occurred at  $14.7 \pm 0.23$  and  $15.0 \pm 0.21$ , respectively. On average the breast and pubic hair reached the adult stage 3.3 and 4.0 years after they began to develop, respectively. The occurrence of menarche was 1.5 and 2.0 years after beginning to develop the breast and pubic hair, respectively.

**Key Words:** Breast development, Pubic hair development, Puberty, Eastern Turkish girls

T Klin J Med Res 1998, 16:16-19

Knowledge of physical changes during puberty is a requirement for the provision of overall care to adolescents. In Western Turkey studies by Neyzi et al (1) in 1975, and Güvenç et al (2) in 1989 have reported mean pubertal ages of Turkish girls, but there is a scarcity of literature concerning the pubertal development of girls in Eastern Turkey.

Studies of the evaluation of signs of puberty in different population groups are of use in clarifying

**Received:** June 18, 1998

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*Presented at XXXIX. Milli Pediatri Kongresi, 4-8 June 1995, Ankara.*

### Özet

Doğu Anadolu Bölgesinden Elazığ'da, iyi gelişmiş ve sağlıklı 498 kız öğrenci ile ilgili cross-sectional elde edilmiş pubertal gelişim verileri sunuldu. Meme ve pubik kıllanma gelişimi Marshall-Tanner ve Winter kriterlerine göre sınıflandırıldı. Meme gelişiminin başlama yaşı (puberte başlangıç yaşı)  $11.4 \pm 0.23$  (ortalama  $\pm$  standart hata) yıl, pubik kıllanmanın başlama yaşı  $11.0 \pm 0.21$  yıl ve menarş yaşı  $13.0 \pm 0.10$  yıl olarak bulundu. Meme ve pubik kıllanma gelişiminin tamamlanması sırasıyla  $14.7 \pm 0.23$  ve  $15.0 \pm 0.21$  yıllarda gerçekleşiyordu. Meme ve pubik kıllanma erişkin boyutlarına başlangıçtan sırasıyla 3.3 ve 4.0 yıl sonra ulaşıyordu. Menarş yaşı, meme gelişiminden 1,5 yıl ve pubik kıllanma başlangıcından 2 yıl sonra gerçekleşiyordu.

**Anahtar Kelimeler:** Meme gelişimi, Pubik kıllanma gelişimi, Puberte, Doğu Anadolu kızları

TKlin Araştırma 1998, 16:16-19

the relative importance of factors influencing sexual maturation. Of these the role of socioeconomic factors is one of the most important (3). This is particularly true for communities where the nutritional state of the children and the standard of pediatric care received still show important differences according to socioeconomic levels (1).

By a cross-sectional evaluation of sexual development in school-girls in their prepubertal and pubertal years, we have attempted to establish the mean ages when the various stages of secondary sexual characteristics such as breast (B) and pubic hair (PH) development, are attained the mean ages for the onset of menstruation in the normal Eastern Turkish girls, and to establish the differences between Western and Mid-Anatolian Turkish girls.

**Materials and Methods**

Four hundred and ninety-eight well developed girls, with ages ranging from 8 to 17 years were selected using stratified random sampling method among the different regional primary and high schools in Elazığ for the study. They all were in good health with no history of endocrinological or severe somatic disorders. Age was determined from the date of birth reported by the child, and later checked from the school record. Each subject was given a complete physical examination. Breast and PH development was classified into five different stages as described by Marshall and Tanner (4) in 1969 by the first author (S.A.). The ratings were assessed by visual inspection because of difficulty of assessing these features in a photograph (5).

Each girl was asked if she had begun to menstruate. If the answer was positive, the date of her menarche was obtained. The mean age of menarche was calculated by probit analysis.

Probit analysis was performed on the staging data to provide mean, standard error of the mean (SEM) and standard deviation (SD) of ages at the start of each event. Spearman's rank correlation was used for statistical analysis.

**Results**

The numerical values of the transition ages of pubertal stages and menstruation mean±SEM (SD) are given in Table 1.

The breasts began to develop in the study population between the ages of 7.9 and 13.8 years

(mean±SEM= 11.48±0.23). Breast 3 and B4 stages were reached at the mean ages of 13.45±0.15 and 14.64±0.21, respectively. Pubic hair 2 age was 11.0±0.21, PH3 and PH4 age were 13.47±0.18 and 14.72±0.13, respectively. Breast 5 and PH5, the completion of B and PH development, occurred at 14.78±0.18 and 15.04±0.21, respectively. Menstruation began between the ages of 10.1 and 15.2 years (mean±SEM= 13.03±0.10).

The interval PH2-PH5 is longer than the interval B2-B5, and the mean intervals are not identical with the differences between the mean ages at which each of the stages were reached. Spearman's rank correlation coefficient for breast sequences are all above 0.872 and highly significant (p<0.001), and for pubic hair sequences are above 0.723 and similarly highly significant (p<0.001).

**Discussion**

A normal onset, duration and completion of pubertal development, which is a transition from childhood to adulthood is very important. In order to interpret sexual precocity and/or delayed puberty-hypogonadism, the average and standard variations of population are necessary (2).

Eveleath and Tanner (6) have collected currently available data on puberty. In Europeans and their descendents, the average ages for B2 and PH2 occur from 10.9 to 12.2 years and 10.4 to 12.2 years; in Eastern Turkish girls, they are 11.4 and 11.0 years, respectively. We have also summarized similar data on the mean age of menstruation and

**Table 1.** Transition ages of the pubertal stages in years at Eastern Turkish girls

	B2 (n=87)	B3 (n=91)	B4 (n=82)	B5 (n=102)	M (n=228)
Mean	11.48	13.45	14.64	14.78	13.03
SEM	0.23	0.15	0.21	0.18	0.10
SD	1.98	1.94	1.62	1.47	1.36
Range	8-14	9-16	11-16	12-17	10-15
	PH2 (n=93)	PH3 (n=85)	PH4 (n=84)	PH5 (n=98)	M (n=228)
Mean	11.01	13.47	14.72	15.04	13.03
SEM	0.21	0.18	0.13	0.21	0.10
SD	1.85	2.01	1.45	1.04	1.36
Range	8-14	10-16	11-16	13-17	10-15

**Table 2.** The mean ages (years) at which different stages of breast development (B), pubic hair growth (PH) and the occurrence of menarche are reached according to various authors from different countries

	B2	B3	B4	B5	PH2	PH3	PH4	PH5	M
Reynolds and Wincs(7)									
North America, 1948	10.8	11.4	12.2	13.7	11.0	11.9	12.5	13.9	12.9
Lcc, Chang and Chan(8)									
China, 1963	10.3	-	-	-	12.4	-	-	12.8	12.8
Van Viermgen et al(9)									
Netherland, 1965	11.0	-	-	15.2	11.3	-	-	14.9	13.4
Marshall and Tanner(4)									
England, 1969	11.1	12.1	13.1	15.3	11.6	12.3	12.9	14.4	13.4
Lichtenstein(10)									
Sweden, 1972	11.0	-	-	-	11.3	-	-	13.1	13.1
Bai and Vijaya(11)									
India, 1974	10.6	-	-	-	10.9	-	-	13.5	13.5
Lee(12)									
North America, 1980	11.2	12.4	13.1	14.5	11.9	12.7	13.4	14.6	13.3
Sizonenko(13)									
Switzerland, 1989	10.9	12.2	13.2	14.0	10.4	12.2	13.0	14.0	13.4
Rosenfield(14)									
North America, 1990	10.9	11.9	12.9	-	11.2	11.9	12.6	-	12.7
Cameron et al(5)									
South Africa, 1992									
.rural	11.6	12.8	14.2	16.6	12.1	13.5	15.2	18.8	14.5
.urban	10.9	11.2	12.1	13.5	10.0	11.7	13.0	16.1	13.2
This paper,									
Elazığ-Türkiye, 1995	11.4	13.4	14.6	14.7	11.0	13.4	14.7	15.0	13.0

**Table 3.** The mean ages (years) at which different stages of breast development (B), pubic hair growth (PH) and the occurrence of menarche are reached according to various authors from Turkey

	B2	B3	B4	B5	PH2	PH3	PH4	PH5	M
Onat and Erdem (15)									
İstanbul-rural, 1974	11.4	12.5	13.5	14.7	11.1	12.3	13.7	15.0	13.4
Neyzi et al (16)									
İstanbul-urban, 1975	10.0	11.6	12.8	15.2	10.8	11.6	12.3	13.6	12.8
Güvenç et al (2)									
Ankara, 1989	10.5	11.6	12.9	14.8	11.4	12.1	12.7	14.4	12.6
This paper,									
Elazığ-Türkiye, 1995	11.4	13.4	14.6	14.7	11.0	13.4	14.7	15.0	13.0

mean age of different stages of puberty (Table 2). The average age for B2 runs from 10.0 to 11.6 years; in Elazığ girls, it is 11.4 years. The closest results for B2 were found in England (11.1 years) (4), in South Africa (10.9 and 11.6) (urban and rural black girls, respectively) years (5), in North America (10.8, 10.9 and 11.2 years) (7,12,14), in China (10.3 years) (8), in Sweden (11.0 years) (10), in India (10.6 years) (11), in Switzerland 10.9 years (13). There is a remarkable agreement between authors, who had important and newer data, as to the

ages at which these stages are reached despite the widely different samples from different countries of the World. However, the estimates for rural black girls from South Africa which record the ages when B5 is reached do not coincide with the general pattern.

The means for PH2 in the worldwide results range from 10.0 to 12.4 years; in Elazığ study it is 11.0 years, which seems to be in accordance with their data. The differences between various authors in their estimates of the mean age at which PH5 is

reached are probably due widely to variations in the exact criteria used to define the stage.

The relative delay of rural and Eastern Turkish children; and the advancement of well-off urban, Western Turkish and Mid-Anatolian children at the onset of B2 and PH2 stages are seen clearly in Table 3. But, only the age of onset of PH2 stage in Elazığ is earlier than age of onset of B2 stage. The clinical implications of these findings are that the hormonal levels influencing the secondary sexual development differ by the ethnic race. Also the mean age at the onset of B5 and PH5 stages in Eastern Turkish girls is greater than Western Turkish and Mid-Anatolian girls.

The age of menarche shows more or less differences in various countries. According to observations, menarche was late in girls with a slender constitution coming from poorer families compared to the girls of wealthy families as well as in country girls compared to the urban girls. However, these observations could not be sufficiently and clearly explained (17). The estimated age of menarche was earlier in Elazığ (Eastern Türkiye) girls by 0.3-0.5 years than in American, European and South African girls and later by 0.2-0.4 years than in Western Turkish girls (Table 2 and 3). Also, menstruation started earlier in urban Istanbul and Ankara, than Elazığ and rural Istanbul (Table 3).

The duration of breast development is more uniform across the studies than is the duration of pubic hair development. In our study the intervals between breast stages and pubic hair stages are not in good agreement with those reported by Marshall and Tanner (4) from England, Cameron et al (5) from South Africa and Lee (12) from North America. Duration of our B2-B3 and PH2-PH3 intervals were longer and B4-B5, PH4-PH5 intervals were shorter. Marshall and Tanner's (4) estimation of the interval PH2-PH5 is, 2.7 years; which is approximately 1.3 years shorter than ours and 3.3 years shorter than that obtained by Cameron et al (5) (Urban black girls). Mean values for the first appearance of pubic hair (PH2) in the British Data may therefore be too high because of the difficulty of assessing this feature by photograph.

The duration of the interval between menarche and the onset of breast development was 1.5 years

and between the menstruation and the onset of the pubic hair development was 2.0 years. In our study the intervals between the menstruation and the onset of breast and pubic hair development correlate with those reported by various authors.

The result of the current study are quite similar to those reported by other authors. The data provide a basis for normal pubertal development in Eastern Turkish girls.

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