

AGE AT MENARCHE IN SARDINIA (ITALY)

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Abstract: The median age at menarche in 2325 Sardinian girls (age 9.00 to 16.99) was calculated with the status-quo method and probit analysis (maximum likelihood estimation according to Finney 1971). Heterosis (assessed by parental endogamy) and the seasonal rhythm of menarche (coincidence between the month of menarche and the calendar month of birth and higher incidence of menarche in some months) were determined. The variations of some anthropometric measurements related to early and late menarche were calculated; the body build of the menstruating girls is greater than that of the non-menstruating ones.

Key words. Menarche; Probit analysis; Heterosis; Seasonal rhythm; Anthropometry.

Introduction

Menarche (appearance of the first menstruation) which indicates female sexual maturity has been reached, depends on several different factors: constitutional, social, geographic, climatic, etc. (Tanner 1960, 1962). Changes in some of these factors (as, for example, better nutritional and hygienic conditions, less fatigue, more psychic stimuli, etc.) has led to a statistically demonstrated, progressive lowering of the age at which puberty begins. As concerns Sardinia, with the retrospective method an average age of 13 was obtained for menarche ($M=13.02\pm 1.32$) (Maxia, Fenu and Floris 1974), while recently, with the status-quo method and probit analysis, the median age was found to be between 12.70 and 12.80 (Floris, Murgia, Sanciu and Sanna 1987).

Within the framework of these investigations, as suggested by Eveleth and Tanner (1978) we report here data on the examination of 2325 girls between the ages of 9.00 and 16.99, considering, besides median age, also some of the factors that influence menarche.

Materials and Methods

During the last three years 2325 girls between the ages of 9.00 and 16.99 (calculating the decimal age and then dividing the sample into groups covering six-month periods), attending different secondary schools in the city and province of Cagliari, were examined using the status-quo method. Median menarche age and its standard error were calculated by analyzing the probits (method of maximum likelihood, Finney 1971). For the age groups between 11.0 and 14.99 certain body measurements (weight, height, sitting height, brachial skinfold) and indices (skelique, body mass and fat%) were taken. These allowed comparisons between menstruated and non-menstruated girls in the same age groups.

Results

The median age of menarche in the sample examined (made up of a total of 1383 menstruated and 942 non-menstruated girls) was 12.78 ± 0.04 $\chi^2=21.95$; d.f.=14). This

figure, which indicates an early menarche compared with the 13.02 year found in 1974, is slightly higher than that has been found in other parts of Italy using the same techniques (12.66 year in Apulia, Grassivaro Gallo and Parnigotto 1982; 12.70 year in the Marches, Grassivaro Gallo 1984) (Table 1).

Table 1. Age at menarche in Sardinia

Total sample (n = 1383 menstr. + 942 non menstr. = 2325)	12.78 ± 0.04
High Endogamy	12.78 ± 0.06
Low Endogamy	12.73 ± 0.06
Families with 1-2 children	12.56 ± 0.07
Families with more than 2 children	12.92 ± 0.06
First born	12.29 ± 0.07
Second born	12.86 ± 0.08
Third born	12.96 ± 0.11
Fourth born and others	12.95 ± 0.11

On subdividing the sample into two sub-groups, one made up of girls whose parents were both born in the same town (more endogamic) and the other of girls whose parents were born in different towns (less endogamic), we found a median age of 12.78±0.06 year ($\chi^2=14.08$; d.f.=14) in the more endogamic group and 12.73±0.06 year ($\chi^2=18.37$; d.f.=14) in the less endogamic group.

The number of children in a family appears to influence menarche. In fact, subjects belonging to families with one or two children had a median age of 12.56±0.07 year ($\chi^2=11.48$; d.f.=14) while those coming from families with more than two children had a median age of 12.92±0.06 year ($\chi^2=33.43$; d.f.=14; $p < 0.01$) at menarche. At the same time, the first-born had a median age of 12.29±0.07 year ($\chi^2=17.21$; d.f.=13) and the fourth-born 12.95±0.11 year ($\chi^2=4.80$; d.f.=11). Thus, even taking into consideration the heterogeneity of one of the groups considered, we have further confirmation of what has been found by other authors (Bodzsár 1975, Štukovsky, Valsik and Bulai-Stirbu 1967, Pasquet and Ducros 1978, Vercauteren and Susanne 1986), that is, that menarche is delayed in large families where the economic, nutritional (fewer proteins) and in general environmental conditions are less favourable (including the fact that on the whole with an increase in the number of pregnancies the mother's age increases, making the intrauterine environment less favourable).

When the subject examined remembered the year, and above all the month, of menarche (fewer subjects than the overall sample) a table of contingencies could be elaborated to see if menarche had a random distribution or not.

If the occurrence of menarche is casual, we should expect a monthly frequency of 8.33% (1/12 with small variations depending on the number of days in the month), while we observed a variation between 5.13% in October and 15.97% in January. Differences between frequencies expected and those observed were significant for the months of January ($\chi^2=12.56$; d.f.=1), October ($\chi^2=9.23$; d.f.=1), February ($\chi^2=5.22$; d.f.=1) and March ($\chi^2=5.20$; d.f.=1). Considering the seasons, the expected frequency should be 25% (1/4), while the frequency observed varied from 22.27% in autumn to 28.27% in summer, although no differences were significant.

The coincidence of month of birth with month of menarche should also take place in 8.33% of cases (1/12), while in this sample it was in 12% of cases, with a significant difference ($\chi^2=7.61$; d.f.=1) (Fig. 1). Thus the influence of some months on menarche is confirmed, probably depending on general climatic conditions, as has been observed by different authors (Valšik 1965, Valšik, Štukovsky and Janku 1973, Bodzsár 1975), while the reason for the greater coincidence noticed between month of birth and month of menarche is still not clear.

Comparison between menstruated and non-menstruated girls in the time interval between 11 and 15 years of age showed that menstruated girls were taller up to 14.5 years, while non-menstruated girls (although not numerous) were taller from 14.5 to 15.0 years of age. Menstruated girls were always heavier than non-menstruated ones. The skelique index was always greater in girls who had menstruated, with mean values indicating mesatyskeliia in all age groups except for 12.00–12.49 in which they were macroskelic (but at the limits of the class), while the non-menstruating girls were always macroskelic, except at 14.50–14.99 years, at which time they were mesatyskelic (Fig. 2).

The body mass index was always higher in the menstruated group, with values between 19 and 20, while the non-menstruated group showed a more irregular trend with values between 16 and 18.

Applying Mellits' and Cheek's equation (in Frisch and McArthur 1974) we also calculated the percentage of body fat in the two groups. The menstruated group always had higher values, which increased fairly regularly from 24% to 26%, while the non-menstruated group had values below 21.2%, with variations in all age groups. It can thus be concluded, in agreement with other authors (Bayley 1943, Guerci 1972, Bodzsár 1975, Floris 1981, 1984, Capucci 1984–85, Prado Martines 1986) that girls who have menstruated, in comparison with those who have not, are, generally speaking, megasomal (taller and heavier) and brachyskelic (higher skelique index and more fat).

Conclusions

In conclusion, with few exceptions, it can be said that:

- The median age of menarche has gone down in the last few years and is now stable at about 12 years and 9 months;

- Factors such as the size of the family and the position occupied in it affect menarche, probably together with other factors such as socio-economic level, consumption of protein, age of the mother, etc.;

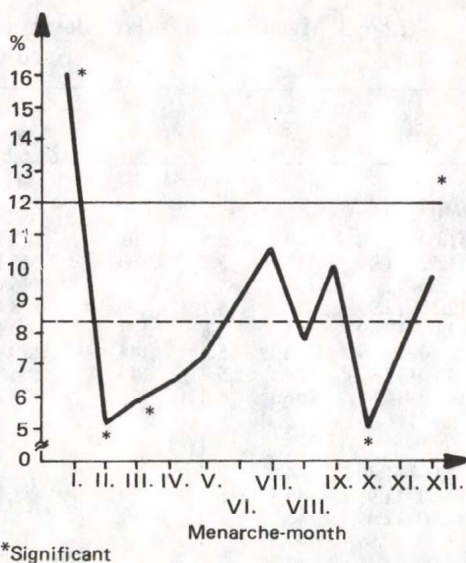


Fig. 1: Monthly distribution of the menarche in Sardinian girls

Table 2. Mean and standard deviation in menstruated and non menstruated Sardinian girls

Age (years)	Menstruated			Non-menstruated			M	Total SD	N
	M	SD	N	M	SD	N			
<i>Height</i>									
11.00-11.49	149.3	5.5	10	142.7	6.4	90	143.4	6.6	100
11.50-11.99	151.7	5.3	36	145.1	6.2	136	146.5	6.6	100
12.00-12.49	151.7	5.7	51	146.9	6.2	99	148.5	6.4	150
12.50-12.99	154.1	4.7	84	148.4	5.9	69	151.5	6.0	153
13.00-13.49	154.1	5.8	129	150.1	6.1	63	152.8	6.2	192
13.50-13.99	154.1	5.5	144	150.4	7.1	30	153.5	5.9	174
14.00-14.49	154.5	5.8	110	154.0	4.9	18	154.4	5.6	128
14.50-14.99	156.1	6.2	127	156.7	6.4	9	156.1	6.2	136
<i>Weight</i>									
11.00-11.49	44.6	9.7		36.3	7.3		37.2	8.0	
11.50-11.99	45.4	5.3		37.0	7.0		38.7	7.5	
12.00-12.49	46.1	8.6		38.6	7.1		41.1	8.4	
12.50-12.99	47.4	7.5		39.2	7.0		43.7	8.3	
13.00-13.49	47.8	7.5		41.7	8.9		45.8	8.5	
13.50-13.99	48.1	7.3		39.7	6.9		46.7	7.9	
14.00-14.49	48.3	7.1		42.3	4.8		47.4	7.1	
14.50-14.99	50.0	7.9		41.1	4.1		49.4	8.1	
<i>Skelique index</i>									
11.00-11.49	52.69	1.35		51.88	1.28		51.96	1.30	
11.50-11.99	52.70	1.57		51.94	1.34		52.10	1.42	
12.00-12.49	52.07	1.38		51.96	1.40		52.00	1.39	
12.50-12.99	52.42	1.44		51.97	1.11		52.21	1.32	
13.00-13.49	52.55	1.51		51.90	1.36		52.33	1.49	
13.50-13.99	52.80	1.24		51.63	1.23		52.60	1.32	
14.00-14.49	52.62	1.45		51.78	1.14		52.50	1.43	
14.50-14.99	52.76	1.41		52.29	2.03		52.73	1.45	
<i>Body mass index</i>									
11.00-11.49	20.00	4.17		17.81	2.74		18.03	2.96	
11.50-11.99	19.73	2.20		17.47	2.43		17.94	2.55	
12.00-12.49	19.98	3.23		17.78	2.51		18.53	2.96	
12.50-12.99	19.97	2.81		17.72	2.44		18.96	2.87	
13.00-13.49	20.08	2.69		18.44	3.36		19.54	3.02	
13.50-13.99	20.21	2.63		17.48	2.11		19.74	2.75	
14.00-14.49	20.21	2.90		17.86	2.03		19.88	2.91	
14.50-14.99	20.48	2.71		16.69	0.92		20.23	2.79	
<i>Fat%</i>									
11.00-11.49	24.32	6.67		19.32	6.25		19.82	6.43	
11.50-11.99	24.61	4.63		18.79	6.11		20.01	6.28	
12.00-12.49	24.68	5.94		19.68	5.96		21.38	6.39	
12.50-12.99	24.90	5.20		19.59	6.26		22.51	6.27	
13.00-13.49	25.30	4.96		21.06	6.74		23.91	5.94	
13.50-13.99	25.60	4.79		19.34	5.13		24.52	5.38	
14.00-14.49	25.58	4.90		20.61	4.29		24.88	5.11	
14.50-14.99	26.22	4.76		18.07	2.63		25.68	5.07	

– Menstruated girls are larger in body measurements and shorter-limbed than those who have not yet menstruated.

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