

## **Age at Menarche in Sofia Girls /2014-2018/**

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The aim of this study was to determine the age of menarche in city girls in modern conditions and to compare it with data for former periods. The comparison shows that in the beginning of 21<sup>st</sup> century the mean age at menarche (calculated by probit analysis) in Sofia girls remains on the same level as in 1980s – 12.7-12.9 years. Its standard deviation is on the level of 1.3-1.4 years, typical for socially heterogeneous samples. The available data do not allow determining whether there was variation of the timing of puberty under the changes of social conditions in the periods between these three researches.

*Key words:* age at menarche, probit analysis, transversal study, pubertal development, Sofia

### **Introduction**

The appearance of the first menstruation (menarche, Me) is used in auxology and related disciplines as a relatively easily researched and objective indicator of puberty in girls. In addition, it is very sensitive to the influence of the environment, especially social conditions, and therefore it is widely used to assess the biological well-being of the reference group [3, 10]. It is most accurately calculated in cross-sectional studies by probit or logit analysis. The data of retrospective studies of adult women can also be used for comparisons with some caveats [10]. The aim of the present study is to assess the age at menarche in Sofia girls at the present time and to compare the results of three cross-sectional studies on the age at menarche in Sofia.

### **Materials and Methods**

*Material:* Individual data of 306 school girls from Sofia city, aged 10 to 14 years, for presence or absence of menstruation. The data were collected during the period 2014-2018.

The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) [12].

*Method:* Status quo (transversal) study, combined with probit analysis (probit transformation and least squares method) for evaluating the mean age at menarche. Probit analysis is based on the probit function, which transforms a normal accumulation curve into straight line (Fig.1 and Fig. 2).

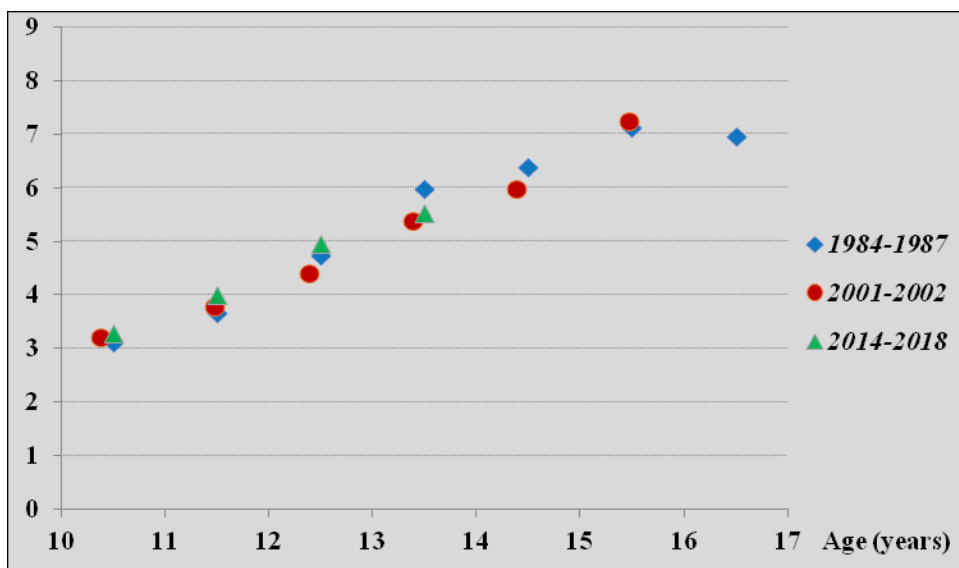


Fig. 1. Proportion of girls post menarche by age in three successive studies in Sofia.

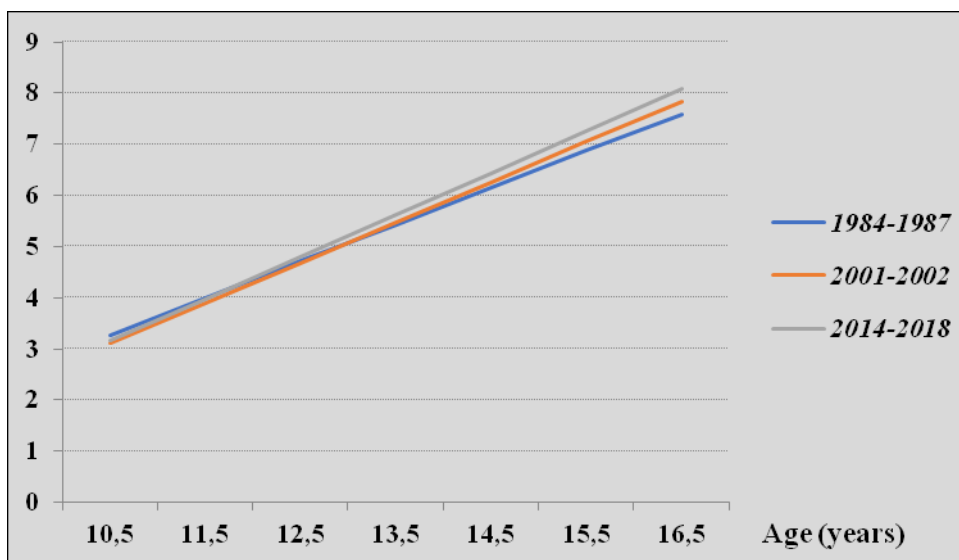


Fig. 2. Probit transformation of the proportion of girls post menarche by age in three successive studies in Sofia – lines calculated by least square method.

The data of other authors for comparison were used, where they could be checked by recalculating the age of menarche by probit analysis. When this was impossible (in some oldest works) the average age of menarche was recalculated from the distribution of retrospective data by age.

## Results

The mean age at menarche, calculated by the data, is  $12.74 \pm 0.10$  years. This is a value typical for urban populations of developed countries. Its standard deviation is  $1.22 \pm 0.07$  years. This value is typical for socially heterogeneous populations [10].

The earliest data about age at menarche in Sofia girls were collected by Academician St. Vatev in women giving birth around 1905 [11] (**Fig. 3**). As the average age at childbirth at the beginning of the 20th century was 30 years these data with an average age at menarche of 14.5 years, reflect the period around 1890. In the next years the age of menarche quickly decreases until the 1960s: about 13.9 years by 1915 – probit analysis, data from Noikov and Katsarov [7]; 13.5 years to 1935 – a probit analysis, data from Mateev [4]; 13.3 years at the beginning of the 1950's – probit analysis, data from Seizov [8]; 13.0 years at the beginning of the 1960s – probit analysis, data from Seizov [9] and 12.7 years at the end of the 1960s – probit analysis, data from Damyanova and Georgiev [1, 2]. Retrospective data collected by Stoev in the 1980s give slightly higher values – 13.7 years in the late 1940s, 13.4 years in the 1950s, 13.0 years in the 1960s and in the 1970s [10]. The small number of data for the 1940s and the differences in the method do not allow us to say whether there was an increase in the age of menarche during the Second World War and the related difficulties in supplies (card system).

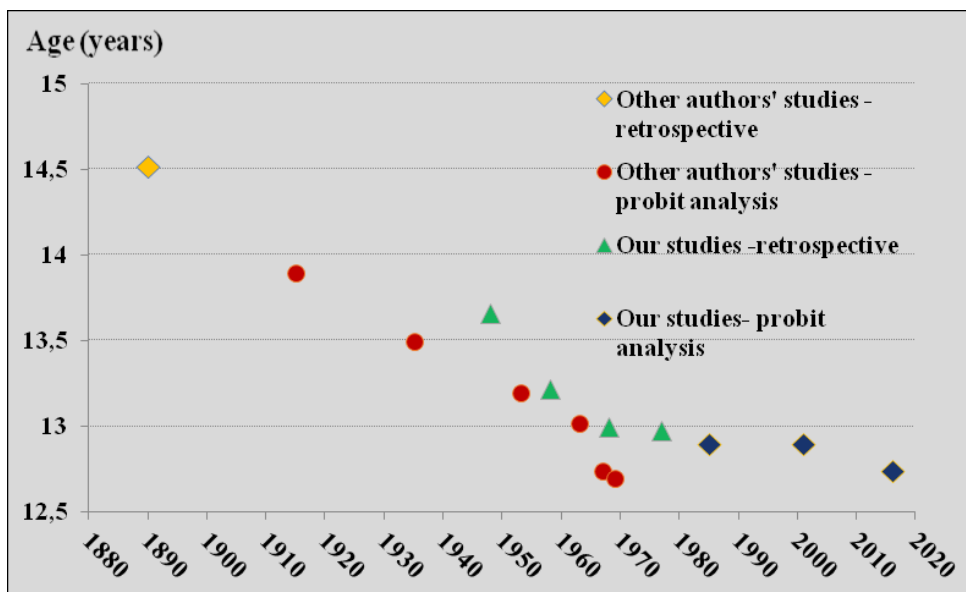


Fig. 3. Changes of age at menarche in Sofia girls from the Liberation until present.

Materials collected by Stoev in the years 1984 – 1987 show that the menarche age of Sofia girls at the 1980s was  $12.90 \pm 0.12$  years (SD = 1.39) [10]. The standard deviation is quite large, because in the study, significant differences in the timing of puberty were found depending on the income, education of the parents, housing conditions, type of household and number of children in the family. According to the materials collected by Mitova in 2001 – 2002, practically the same menarcheal age can be traced –  $12.92 \pm 0.09$  years (SD = 1.28) [5].

Unfortunately, there is a lack of materials for the analysis of the movements of age at menarche during the period of economic difficulties in the 1990s. At that time, a longitudinal study of the growth and development of Sofia children and adolescents was conducted, but it gave an unrealistically low age of menarche – 12.4 years, apparently due to the specific social composition of the sample (in the 1980s, such an age of menarche was observed in schoolgirls in prestigious neighborhood of Sofia). At the same time, the survey data of 15-16-year-old girls in the same schools where the longitudinal study was conducted (all but one menstruating) give an average age of menarche again of 12.9 years, i.e. six months older. Since they were examined in 2001, this may mean that there was some delay in the age of menarche during the most difficult period of 1991 and 1997 [6].

## Conclusion

The acceleration of the menarche age in Sofia stopped at the end of the 1960s. Since then, the age of menarche in Sofia girls has stabilized, or rather, fluctuated at the level of 12.7 – 13.0 years (differences are unreliable). Insufficient data on social differentiation and lack of data for the subsequent period give grounds for new research.

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