ACTA BIOL. SZEGED. 34. PP. 187—193 (1988)

THESIS OF DISSERTATION FOR ACADEMIC DOCTOR DEGREE

SOMATIC DEVELOPMENT AND AGE AT MENARCHE OF 10—18 YEAR OLD GIRLS OF SOUTHERN HUNGARY

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(Received: June 30, 1987)

I. Theme of the research, antecedents and aims

Two very important processes are taking place in man's postnatal life concerning his/her later fitting in society: sexual and social maturation.

The chronological interval between the expiry of them has increased mainly because sexual maturation has been assigned to an earlier age in the last few decades in Hungary, too.

Sexual maturation supposes that young people are educated and informed in this field. As a result they acquire ability and a form of behavior that are necessary lead to a balanced way of life.

The question is, however, when to begin sexual education at school as well as how deep and graded it has to be. It can't be regulated by rules valid for ever. On the basis of the above mentioned considerations it is necessary periodically to control the time of pubescence and the education and information have to be changed according to needs. New relations are to be discovered to carry on this work, and partly this can be solved with human biological research influencing pubescence. Man is a biological and social being at the same time, social factors also have to be taken into account.

Man's sexual maturation is a complicated process regulated by neurohormon system. An experimental research of healthy young people with a large number of sampling can't be carried out because of several reasons. So girls' first menstruation (menarche) and boys' first ejaculation time (pollution) are examined. As the observation of the latter is very uncertain we can get some information about the beginning of pubescence on the basis of studying menarche.

The first foreign study about menarche is connected with the name of HALLER (1775), and in Hungary SEMMELWEIS was the first man to publish data (1860). To study it we have three possibilities: status quo, the prospective and retrospective methods (FALKNER and TANNER, 1978). The first involves the second one as well, and can be considered the best method of collecting data; in spite of this, status quo method is used by most of the researchers since the study of a population requires at least 8—9 years.

It is difficult to compare the results because the methods of evaulation are different. Results got by the probit analysis (WEBER, 1961) have been considered to be the best during the last few decades. The girls' pubescence has been examined in connection with some factors. They can be divided into three groups: endogenic factors having close connection with girls' biological being, exogenic factors that can be either natural or social, and at last endogenic and exogenic factors have conjugate effects.

All these factors have not been examined simultaneously with the same population on large samples.

As in normal circumstances menarche begins in Hungary between the age of 8—16 (SAS and KOVÁCS, 1984) from methodological points of view it seems to be enough to begin to collect data in the senior classes of the primary school, and to study several factors simultaneously is most expedient concerning menarche of girls between the age of 10—18 with the help of anonymous questionnaire method.

Taking into consideration the experiences of special literature home and abroad we set the following aims:

— collection of large, random, representative sampling of girls between 10—18 living on one geographical area (County Csongrád, Southern Hungary);

— in order to make comparison easier samples have to be taken in other parts of the country as well;

— collection of data concerning the given age-groups has to be extended to pupils of primary, secondary and vocational training schools as well;

— in order to define boys' physical development, their body weight, body height and normal chest circumference have to be determined, only this way we can get a real picture of the physical development of boys and girls;

— collection of data — because of the above mentioned aims — has to be extended slightly to the age groups of younger than ten years old;

— all the factors having been examined before should be in the programme of research;

— the results of the research are to give possibility for a critical evaluation of questions of theoretical importance;

— on the basis of the results the order of factors influencing pubescence are to be established;

— the results have to help sexual education at primary school as well as its succession in time.

II. Sample and methods

For our research we made questionnaires suitable for computer processing both for boys and girls. The girls' menarche questionnaire contained 32 questions, 3 of wich directly aimed at menarche time.

There were 22898 boys and 32156 girls in the sample.

The great majority of sample has been derived from County Csongrád but some samples have been collected in the northern part of Hungary, in Transdanubia and in the territory east of river Tisza. This work was done by the co-workes of Department of Anthropology of A.J. University and the Public

Health and Epidemiology Station of County Csongrád. This research was carried on as a state assignment topic and sponsored by the Ministry of Health and Ministry of Cultural Affairs.

We used the MARTIN and SALLER auxological anthropological technique (1956), somatoscopic observations were carried on according to TANNER (1962) with the help of Harpenden instruments, scale and colour scale. Pupils were wearing gym suit, while establishing the development of secondary sex characteristics schoolgirls of primary school took it off.

Observations and measurements according to the different characters i.e. collection of data were made by the same persons between 1981 and 1984. To establish skeletal maturity radiograph was taken of the left hand of a limited number of boys and girls. They were evalued by TW 2 method (TANNER et al., 1975).

Coding was made by the same two persons, certain questions were coded by the same person. In some questions such as occupation of parents, size of domicile definite categories were established for sake of uniformity.

The evalution was made by the László Kalmár Cybernetic Laboratory using Osiris program by Computer R-55.

IBP decimal table was used to calculate age then half year age-grouping was made.

Secondary sex characteristics were evaluated by the 12 point method by SCHWIDETZKY.

Concerning auxological characters the most important parameters (n, $\bar{x}$, s, w) were calculated according to sex and half year age-groups, with the help of which normal ranged ($\bar{x} \pm 1.96s$) were formed to estimate physical development. Subsamples made according to different viewpoints were comparted by two-sample Student's test on 95 p.c. probability level. After standardization further analysis was carried on by variance analysis based on variance ratio test.

According to the examined factors the medians and 95 p.c. confidence intervals belonging to them were defined by probit analysis. The order of succession of factors was defined by and additive predictive model.

III. Summary of results

1. PHYSICAL DEVELOPMENT

The physical development of both sexes can be said to be good but the rate overweight pupils is of high percentage. The means of body weight and body height show further increasing while the means of average chest circumference are decreasing.

The physical development of apprentices of both sexes is significantly worse than that of secondary school pupils, the difference in case of girls is less than at boys.

As for girls significant differences cannot be found in body weight, normal chest circumference, biiliac diameter and birth weight on the basis of distance from the place of birth of parents. The body height of children of parents from further domicile is higher, and significant differences can be observed especially in pubescence and postpuberty.

No marked differences can be determined in the average of body measurements of the young living at domiciles of different sizes. At the same time the effect of urbanization on girls is stronger.

Significant differences in the body messurements of boys living in different parts of the country can only be found in different age-groups and mostly in stature what it may be due to ethnical differences. The differences in girls' age-groups are bigger and in all the three measurements the frequency is nearly the same.

2. GIRLS' PUBESCENCE

The median of the whole sample is 12.79 years, and the corresponding confidence interval is between 12.46 — 13.11 years. Menarche-median in Hungary has decreased by 0.41 years compared with that in the 1960—ies (BOTTYÁN et. al., 1963).

The average of auxological characters of the examined postmenarcheal girls is higher than that of the non-pubescent. At the same time the age of maturation can't be joined with a critical body weight as the lack of menstruation occurs with girls with large body weight, but there were girls with low body weight and their menarche began.

The medians of secondary sex characteristics are the following: median of telarche 12.44 years, that of pubarche and axillary hair 12.60 years.

There is no significant connection between the colour of the eyes and menarche. What for the colour of hair and menarche it can be supposed that girls having dark hair mature earlier while girls with light-coloured hair later.

The relation between skeletal maturity and menarche is closer than that between menarche and chronological age. But this has only been controlled on a small sample.

Coincidence between the year of menarche of girls and mothers can only be expected in 28 cases out of 100.

Coincidence between the month of menarche of girls and mothers (super-coincidence) cant't be expected in most cases.

Between the arithmetic mean of the absolute menarche-age of mothers and of their daughters there is one year difference; the pubescence of the latter began a year earlier. There is not any significant difference between the median and the arithmetic mean in a large sample. If the two arithmetic means in mother's and daughter's relation are known, the results obtained by the status quo method can be compared in case of the retrospective method for collecting menarche data.

Together with the increase of the distance between the place of birth of parents to 200 kms the median increases, but the difference is so little that on this basis we can't speak about a heterosis effect.

Though the secular trend of menarche can be observed in Hungary but its pace has slowed down lately and it indicates that we have reckon with a deceleration. On comparing the country-wide medians we can realize that the predicted decrease of the menarche-median in a 3—5 month decade can't be observed. We can get more reliable information on the tendency of a changing median if we examine it on the basis of the girls' date of birth. But as in our case as well, it requires a large sample.

The median changes according to the order of succession of birth, the first born children reaching puberty earlier than the second and the third born girls.

There isn't significant relation between the father's and mother's age and the time of maturation. But if both parents are older and they are of the same age their daughter reaches pubetry later.

Light and the meteorological phenomena connected with it have some effect on the time of maturation, they stimulate the menarche to begin earlier.

There is a positive correlation between the height above sea level of the domicile of girls and the time of maturation, as the girls living on higher domicile reach puberty later. This can be noticed even if the difference is only a few hundred meters.

There is some relationship between the education level of parents and their daughter's time of maturation: the lower is the level of the parents' education, the later their daughter reaches puberty.

Daughters of mothers and fathers with intellectual occupation (graduates of university, college or secondary school) begin to menstruate earlier than those of parents occupied as industrial, agricultural or other physical workers.

The higher the number of living brothers or/and sisters of a girl the later her menarche begins. This relationship is more valid with 0—5 sisters.

If the average achievement of the girls is worse then their menarche-median is 0.2 years higher than that of the girls whose achievement is better.

On the basis of the size of domicile (number of inhabitants) we can establish that the menarche-median of the girls living on a domicile with more inhabitants is lower than on a smaller domicile. On the domicile with 200.000 to 5.000 inhabitants it shows an ever increase but girls living on a domicile less than 5.000 reach puberty earlier.

Menarche shows seasonality as most of the inquired girls began to menstruate either in winter or summer. In case of mothers only the summer maximum can be verified.

The above mentioned results correspond to earlier experiences in Hungary and abroad though in parts there are some differences as well.

It can be supposed that the biannual cups of distribution curve of menarche-age experienced at human beings has developed during the evolution and it may have connection with the sexual seasonality observed with lesser breeds of Primates order.

Significant similarity between the month of menarche of mothers and of their daughter's has not been supposed.

Coincidence between the month of menarche and that of birth of girls could be found in 11.08 p.c.At the same time there is no mathematical correlation between the two variables, and on this basis it can be concluded that the month of birth doesn't determine the month of menarche.

The menstrual cycle of 18 p.c. of girls didn't become regular in 1—2 years after the menarche began.

52—53 out of 100 pupils have got information from their parents on problems concerning pubescence. And it means that the 10—18 year old girls' sexual education cant't be regarded to be satisfactory. From this point of view different relative frequency can be established in different parts of the country.

The order of significance of factors examined by the additive predictive model is as follows:

year of birth of inquired girls;

size of domicile (number of inhabitants);

county of girls' domicile;
number of living sisters;
occupation of mother;
age of mother at the time of daughter's birth;
number of living brothers;
the order of birth of the girl;
occupation of father;
the distance between the place of birth of parents;
the colour of the girl's hair.

IV. New results

Collecting auxological and somatoscopic data was carried on by the same persons in the whole research in order to avoid making mistakes surveying was carried on by one, and observation by another person what is very difficult at large number of samples.

As far as we know it was the first case in Hungary or even abroad when menarche and the connection of 32 factors as well as the development of secondary sex characteristics have been studied simultaneously with the same population at about 32.000 girls.

We tried to systematize all the factors connected with menarche and mentioned in special literature.

From methodological point of view it's quite a new thing to compare menarche-median with average of menarche (calculated from the chronological age at menarche at the same sample). So the collected data by the retrospective and status quo methods can be compared.

Auxological anthropological characteristics (boys' body weight, body height, normal chest circumference, and at girls biiliac diameter and birth weight) as well as the change of the menarche-age of girls on the basis of the distance between the place of birth of parents could be first analysed on a Hungarian sample. On this basis the heterosis effect at the occurrence of menarche can be disputed.

The menarche-median decrease by 3—5 months in a decade can't be supposed, at Hungarian girls even a deceleration can be reckoned with (menarche-median is rising again, and girls reach puberty later).

The menarche biannual occurence can presumably be connected with the process of anthropogeny being accomplished by reproduction.

The great number of factors being examined simultaneously with menarche made it possible to arrive at a conclusion concerning their order of significance.

The order of importance of factors is a good basis for establishing an evaluation factor, with the help of which the girls' menarche time can be predicted with 3—4 month accuracy. This method, however, still needs further improvement.

V. Practical utilization of results

The regularities based on the factors that can be connected with menarche as well as the knowledge of the order of significance of factors makes it possible to define the exact time of the beginning of the sexual education in the school. So it is definitely necessary to give girls informations about sexual hygeny in the second half of the sixth class and in the first half of the seventh class in the primary school.

The time of menarche can be predicted by the coefficients calculated by additive predictive model.

Results of menstrual cycle concerning its regularity as well as the information about the development of secondary sex characteristics can be very useful for pediatric gynaecology. At the same time the sample of examination can be considered as a control in pediatric gynaecology concerning teenagers.