

ONE POSSIBLE HYPOTHESIS OF THE MENARCHEAL SEASONALITY

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Abstract

The seasonal fluctuation of girls' menarche-age was observed more than fifty years ago. It was supported by data collected in the most different countries in the world as well as in Hungary. However we can't find any reference to the interpretation of this phenomenon. Endocrinological researches performed the fact that melatonin produced in corpus pineale is in close connection with the circadian rhythm. At the same time the quantitative change of melatonin can also be brought into connection with the circannual rhythm of seasons. This observation refers to the fact that our sensitivity for this rhythm developed in the course of evolution. On the basis of the menarche data of more than 32 thousand Hungarian girls the menarche seasonality can be connected with their circadian-circannual sensitivity.

Key words: menarche, seasonality, melatonin, light effect.

Introduction

Two very important processes taking place in a person's postnatal life, concerning their later fitting into society are: sexual and social maturation. A person's sexual maturation is a complicated process regulated by the neuro-hormonal system. Experimental research of healthy young people with a large number of samples can not be carried out because of several reasons, so the time of girls' first menstruation (menarche) was examined.

Material and methods

For our cross-sectional research we made questionnaires suitable for computer processing. The menarche questionnaire contained 32 questions, for example: occupation of parents, education level of parents, the crow-flight in km between the birthplaces of father and mother, the number of brothers and sisters of a girl, inhabitants of birthplaces of parents and girl, the birthorder of girl in the family, the type of school of girl (primary, secondary, vocational training school). Three of this questions were directly aimed at age at menarche: is or is not menarche of girl, the exact menarche time (year, month, day), is regulate the menstruation cycle or not.

There were 32156 girls — between 8—18 year old — in the sample. One half of the sample (16.000 girls) was been derived from county Csongrád (in Southern Hungary), with the remainder of the sample collected in the northern part of the country, in Transdanubia and in Eastern Hungary, as well (FARKAS, 1986).

Results

The median of sample is 12.79 years. Among our results, we now consider only the explanation of seasonal distribution of menarche.

The onset of first menstruation fluctuates with the seasons (Fig.1.). The most girls menstruated at first in January (13.1%), in August (11.8%), in July (10.5%) and in June (10.1%). The smallest relative frequency of menarche was in October (5.6%). Menarche had occurred in their mothers with the greatest relative frequency in May (14.9%), in June (12.8%) and in March (10.4%), the smallest relative frequency of menarche in their mothers was in December (5.7%) and in November (5.0%).

Discussion

In the literature dealing with menarche, several authors have pointed out that the occurrence of menarche varied over the twelve months of the calendar year.

Attention was first called to this by PELLER and ZIMMERMANN (1933) and was described by ENGLE and SHELESNYAK (1934) and VALSIK (1934), as well. Following this, it was mentioned by several additional authors and we know only one author, who denied the existence of seasonal variability (WICH, 1965). Most opinions emphasize the greatest frequency in winter (BREIPOHL, 1938; VELISAVLJEV

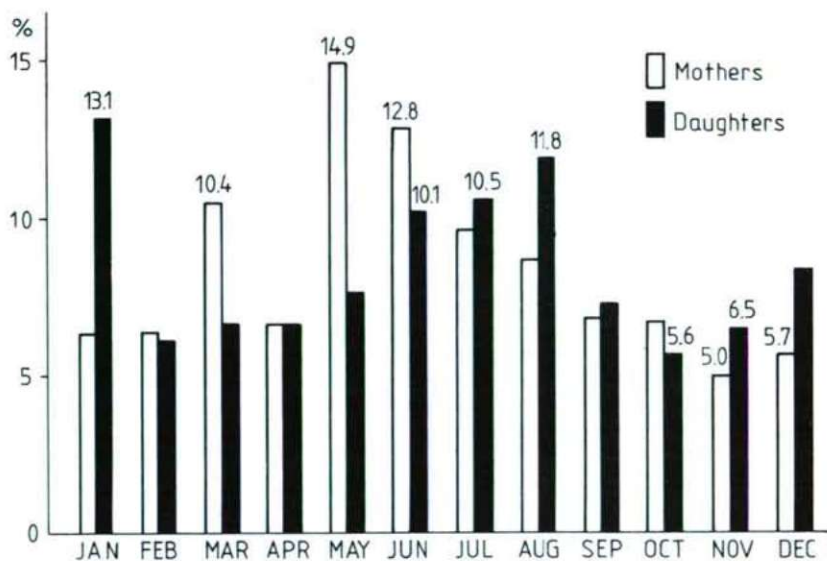


Fig 1. The relative frequency of menarche of mothers and their daughters according to months reported by FARKAS (1986)

and MESELDŽIJA, 1974; etc.). The occurrence of the greater peak in winter and the smaller one in summer is often mentioned (RICHTER, 1973; etc.). Some authors have only found a summer maximum (FARKAS, 1970; NECRASOV et al., 1964; WICH, 1965), while others have found a greater winter frequency and a smaller summer peak has occurred (DAMJANOVSKI and GAVRILOVIČ, 1978). According to some authors (HAJN and KOMENDA, 1982; VALŠIK, 1960) girls living in town show a winter maximum while girls living in the country show a summer maximum. Finally, some authors have observed a different maximum according to the late or early puberty of girls (ŠKERLJ, 1942). It is remarkable that the some authors have published different results from the same country. These authors have made no attempt at finding an explanation for the seasonality of menarche.

In the following we call your attention to a possible explanation.

We start with the fact that we had earlier seen a correlation between menarche and the amount of light, e.g. number of sunny hours, average temperature, etc. (FARKAS, 1979). It has also been shown, that — as a consequence of the natural and artificial light — the pineal gland reacts with a decreasing melatonin production which then stimulated the process of pubescence (Fig.2.).

In the human organism, the melatonin concentration to the blood serum is high after birth until about the 8th year of life, suppressing the occurrence of pubertas precox (ATTANASIO et. al., 1985). At the time of puberty the ratio of melatonin and sex hormones change in antagonistic ways (Fig.3.): the concentration of melatonin decreases while that of the hormones increases (SILMAN et al., 1979).

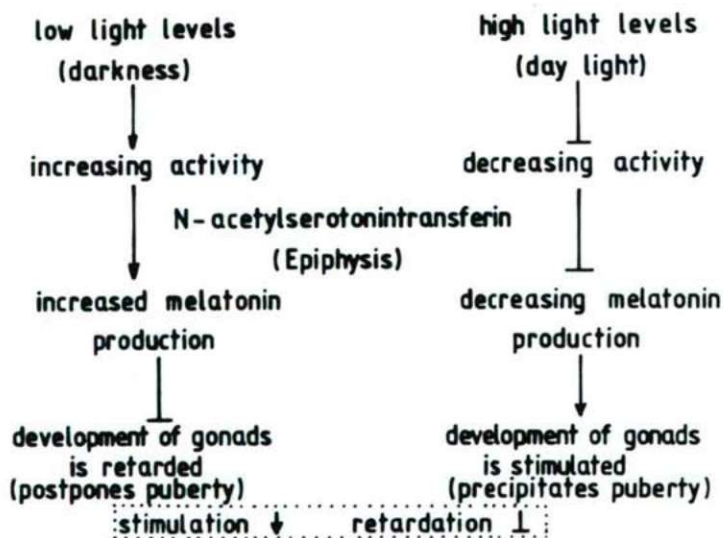


Fig 2. Connection between light levels and melatonin production

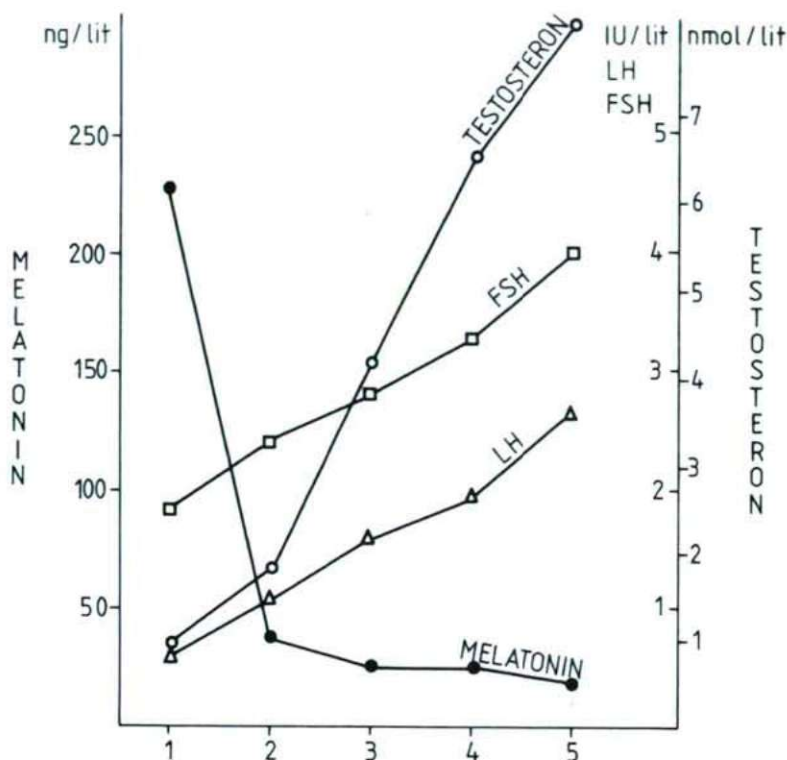


Fig 3. The connection between the change of sexual hormones and melatonin according to genital development stages (SILMAN et al. 1979)

At the same time, one reacts very quickly to the circadian changes of day and night. According to some authors the melatonin level in the blood serum is the highest at night between 1—3 o'clock (Fig.4.), while it decreases during the day (SMITH et al., 1981). In the same way, we see the circannual changes in Europe with a greater quantity of natural light in summer and a smaller quantity in winter.

With this knowledge, we may attribute the greater frequency of menarche in summer to the circannual rhythm. The winter peak however can not be explained in this manner and it may only be brought up as argument that the circadian-circannual sensitivity has developed in all living being and it is so strongly fixed that not even humans can get out of its way. This sensitivity however, may be artificially influenced (RADNÓT, 1953).

Under the influence of the night artificial illumination, melatonin production in the women decreases, which verifies the fact that melatonin formation is influenced by an increase in artificial light (WURTMAN et al., 1963).

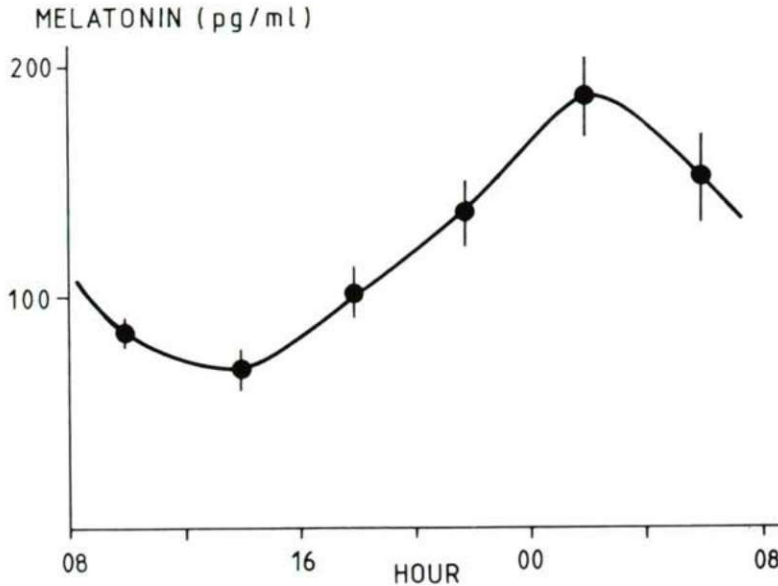


Fig 4. The circadian rhythm of melatonin production reported by VAUGHAN (1986)

Conclusions

In Hungary, television viewing has increased in the last few decades, street and school illumination has become more modern and in short, the quantity of artificial light has increased. In this two decades the median decreased from 13.20 to 12.79 years in Hungary. The lower quantity of natural light in winter and spring has therefore been artificially increased. It is therefore possible that the greater frequency of the mother's menarche in March has been transferred in the case of their daughters to January.

It is, of course, not possible to interpret every observation in this way, because other socio-economical factors also have a role in this case. It remains however, without question that the connections mentioned here are based on objective facts.

At the same time, it is evident that the role of the pineal gland in the pubescence of humans is much more important than it was previously thought.

As shown by experiences we may also conclude — possessing other experimental results — to physiological process of puberty by the indirect method.

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