

Secular Trend in Stature and Age at Menarche Among Punjabi Aroras Residing in New Delhi, India

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ABSTRACT

The study was conducted on Punjabi Arora girls (n=159) and their mothers to see the phenomenon of secular trend in stature and age at menarche. An increase in stature and decrease in age at menarche was reported when the data of daughters was compared with that of their mothers thereby indicating secular trend in these two parameters. Better living conditions, improved nutrition and medical facilities, changes in environmental and socio-economic factors may account for increase in stature and early biological maturation.

Key words: secular trend, menarche, maturation, India

Introduction

It has been noted that the average age at menarche is gradually going down¹. In other words girls are having the onset of menstruation at earlier age or they are sexually maturing earlier. In Sweden during the last 50 years, the average rate was 10 days per annum, in Japan it was one year in a period of 8 years², in India a decrease of 5–7 days per annum was observed in Bengali Hindu girls.³ Earlier sexual maturation of girls has also been documented by Cameron⁴ among London girls. In Northern and Eastern Europe the trend in menarche age has stopped⁵,

menarcheal age has fallen steeply but is stable at around 13 years and may be rising again. There is variability for age at menarche between women across different countries or across different ethnic groups⁶. Thomas et al.⁷ suggested age at menarche to be mainly determined by extrinsic factors such as adult illiteracy rate and vegetable calorie consumption, their results revealed that age at menarche reflects trend in energy balance. There are several other factors, which influence the menarcheal age such as genetic parameters⁸, health and life style⁹, so-

cio-economic conditions¹⁰, nutritional status¹¹, seasonality¹², physical activity¹³, and altitude level^{1,14}.

The other important variable that exhibited a change in its magnitude over years is stature or body height. By combining the above-mentioned parameters, it can be said that children are growing taller and maturing earlier over the years.

Ford¹⁵ studied growth in height of ten siblings from a English family. He found the son grew 5% faster before adolescence and matured a year earlier than the father. The acceleration or retardation of growth and maturation as indicated by changes in height, weight or other variables over time is known as secular trend. The secular increase in stature is well documented in the USA¹⁶; nearly all European countries^{17,18}, Japan¹⁹, USSR²⁰, Greece²¹, Madhavan et al.²² also reported a secular increase in height and weight in India. Kapoor and Kapoor²³ reported a secular trend in stature among high altitude populations of Rang Bhotias and Rajis living in Himalayas. A secular trend in birth length has been observed in newborn babies also.²⁴ Schmidt et al.²⁴ noticed rising trends in height in 11 European countries, rates of 30 mm / decade have been achieved in Eastern Europe and Japan²⁶.

This secular trend has generally been attributed to decline in the frequency of illness, improvement in hygienic and housing condition, better nutrition, better health care facilities, etc. In most of the industrialized countries this trend has however stopped but in developing countries due to continuous improvement of living standards, nutrition and health facilities, the secular trend in various biological parameters is still observed.

One of the great advantage of measuring parent and children is that the comparison of body parameter and sexual maturation indices can easily reveal the

presence or absence of secular change. In the population under study the life style has changed over the years with higher literacy and better nutritional status, women have become more conscious about the health aspect of their families. More and more women are taking employment to supplement the family income. Use of contraceptives, age at marriage and the number of children are more of concern now days. The senior author belongs to the same community and has observed changes hence the population selection.

Materials and Methods

The present study has been conducted on 159 girls and their mothers so as to see the presence or absence of secular trend in stature and age at menarche. All the girls were 16 years of age, decimal age calendar of Tanner was used to calculate their age and girls between 15.500 to 16.499 were considered to be of 16 years. All the girls had experienced menarche and were in senior secondary school studying in 9th to 11th standard wherefrom their mothers were called or approached, interviewed and measured. The stature was measured following procedural details and precautions of Weiner and Lourie²⁷. The annual per capita income of the subjects was Rs. 1000.00 to Rs. 4500.00 per month which is low as per the census. The age of mothers ranged from 36 to 45 years with a mean of 40.5 years. Forty percent of mothers were housewives and the rest of them worked as housemaid or casual worker in factories. Information on age at menarche was taken for mothers as well as the concerned daughters. All the daughters could recall their exact age of onset of first menstruation. In case of mothers it was a little difficult. Recalled age at menarche is very much inaccurate²⁸. Koo and Rohan²⁹ found that short-term recall of age at menarche were quite accurate where as lower accuracy

was observed with longer interval of recall. Livson and McNeill³⁰ found a correlation coefficient of 0.75 between the recalled date and the actual one. Thus mothers may not be reporting the age correctly but chances of making the mistake are very few because 80% could recall the age at onset of their menstruation with the help of class in which they were studying, particular festival or other important happenings, in relation to age at marriage and/ or age at first conception. These are the social events where significance is attached to correct reporting. Mean of stature and age at menarche was computed. To know the significance of the difference for stature and age at menarche between mother and their daughters, unpaired t-test was applied³¹.

Results

Table 1 displays a comparative account of mean values and standard deviations of stature and age at menarche in mothers and their daughters.

It has been observed that the daughters showed a significantly higher mean value for stature ($X = 154.8$ cm, $SD = \pm 4.78$ cm) than their mothers ($X = 149.5$ cm, $SD = \pm 4.37$ cm). The increase in stature between the generations was 5.3 cm. It was found that the difference between stature of mothers and their daughters was statistical significant ($t = 3.479$, $p < 0.01$).

The mean age at menarche of daughters was 12.8 years and of mothers it was

13.3 years. The difference between the mean values of age at menarche of mothers and their daughters was found to be 0.5 years. The daughters showed early menarche. It was noted that the difference between the age at menarche of the mothers and their daughters was statistically significant ($t = 3.535$, $p < 0.001$).

Discussion

One of the advantages of studying two generations for body measurements and biological maturation is to observe any significant increase or decrease in a given parameter. It could be due to the fact that despite the genetic continuity in parents and their children, the environmental factors under which they grew up, are quite different. It is a well-known fact that each genotype for its expression is dependent on environmental factors.

It was observed that the stature of daughters was significantly more and their age at menarche was significantly lower than their mothers. In Japan and India a decrease of 5–10 days per annum in the age at menarche was also reported by Matsumoto et al.² and Sarkar and Roychaudhury³² respectively. So the new generation is not only getting taller but is also maturing earlier. This trend, however, was observed in developed countries much earlier³³ and now has been reported to have stopped there^{4,34}.

Kapoor and Kapoor²³ showed a positive secular trend for height in high altitu-

TABLE 1
SECULAR TREND IN STATURE AND AGE AT MENARCHE

Subjects	Variable	Mothers X \pm SD	Daughters X \pm SD	Difference	t
Mother : Daughter	Stature (cm)	149.5 \pm 4.37	154.8 \pm 4.78	5.3	3.479**
Mother : Daughter	Age at menarche (2 yrs)	13.3 \pm 1.36	12.8 \pm 1.04	0.5	3.535***

** $p < 0.01$ *** $p < 0.001$

de Himalayan populations. The secular trend was due to improved medical facilities and environmental conditions over the last three decades. According to them increase in stature and early biological maturation confirmed the genetic predisposition in a population. Kapoor et al.²⁴ displayed increase in birth length over a decade in infants belonging to Punjabi families which indicated that a secular trend towards larger size existed even at birth. This change has been attributed to better living conditions and medical facilities.

Durnin and Weir³⁵ explained the difference in stature of parents and their children due to better nutrition in latter and shrinkage in stature in old age (parents). Madhavan et al.²² interpreted the greater height in younger generation indicative of better growth and the standards of recruitment to the jobs could also be partly responsible for that trend. Blanksby et al.³⁶ explained secular trend in Australia reasons being higher general standard of living in younger generation as it was coming out of economic depression.

As the age of mothers was less than 50 years in the present study, the age related compression in intervertebral discs and a consequent decrease in stature is ruled out. These observations are in line with those of Susanne³⁷.

Kaur and Singh³⁸ reported higher mean values of stature in sons and daughters as compared to fathers and mothers respectively. Kapoor and Kapoor²³ also observed a higher mean value for stature

in daughters as compared to their mothers indicating secular trend towards increase in height.

Genetic, environmental and socio-economic factors influence stature, body weight and age at menarche^{39,40}. As a result, changes of environmental and socio-economic factors have resulted in a progressive decreases in age at menarche and an increase in stature²¹.

In the present study an increase in stature and decrease in age at menarche was reported when daughters were compared with their mothers thereby indicating the presence of secular trend in the Punjabi Arora females. The urban Punjabi Arora population has undergone a significant social change over the year with females getting better education; there is a decrease in gender bias and improvement in living conditions. Females from lower and lower middle class families have started earning now, adding to their family income and it has improved their socioeconomic status. Over the years more and more females go to school. The literacy rate of women in Delhi is now 75% according to census in 2001, which was 66.9% in 1991. Education brings more awareness about self and family's health. The grandmothers of the present girls were housewives and had early marriages. The gender bias in food distribution is less in today's generation. Thus, with the improvement in living conditions, the genetic potentials have been expressed more than in the parental generation.

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SEKULARNI TREND U VISINI TIJELA I DOBI MENARHE KOD PUNJABI ARORA POPULACIJE NASTANJENE U NEW DELIJU, INDIJA

S A Ź E T A K

Studija je provedena kod Punjabi Arora djevojčica (n=159) i njihovih majki kako bi se vidio je li prisutan fenomen sekularnog trenda u visini tijela i dobi menarhe. Kada su podaci kćerki uspoređeni s podacima njihovih majki utvrđen je porast u visini tijela i pad u dobi menarhe, što upućuje na prisustvo sekularnog trenda u ova dva parametra. Bolji uvjeti života, poboljšana prehrana i medicinske usluge, promjene u okolišu i socio-ekonomski čimbenici mogu se ubrojiti među čimbenike koji su značajan za porast u tjelesnoj visini i ranom nastupu biološke zrelosti.