

Overweight and Physical Activity as a Measure of Age at Menarche in Females

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Abstract The present study is conducted on 62 girls, out of which 31 girls belong to physically active group with a training age of 8.95 years and 31 girls are from physically inactive group considered as control group. The girls were evaluated for their decimal age, age at menarche, height, weight body fat percentage and BMI. The body mass index and body fat percentages were significantly correlated and an inverse correlation was found. The higher body mass index, the lower was the age at menarche. The physically inactive girls were overweight and also early mature. The age of menarche of physically active girls was significantly delayed as compared to their inactive counterparts.

Keywords: physical activity, BMI, body fat, menarche

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1. Introduction

With the advancement of technology, there is an increase in the physical inactivity towards every section of society including children also. It has been observed that they have been declining their habitual physical activity even. As a result of which there are certain changes in response to attainment of their growth markers, the very important of which is attainment of puberty. (Mathur and Toriala, 1982; Moisan et al, 1991 and Lalys and Pineau, 2014). In females, age at menarche is very important biological marker to assess the sexual maturation or in other words adolescence. Adolescence growth periods extents for 2.5 to 3 years and it include-Height gain, Weight gain and increase in body fat percentage. (Sidhu and Grewal, 1980; Rokade and Mane, 2009 and Warren,1980). Menarche may be stimulated by attainment of critical weight. According to Frisch(1970) menarche occurs when a girl attain desired body fat a minimum of 17% of body weight is necessary for onset of menarche. It may also occur when enough gonadotropin hormones are released from the pituitary and hypothalamus. Physical activity is also very important parameter to be considered for age at menarche. Research has reported that there is delay in menarche in athletes due to inherent physique, imbalance between energy intake and output and disordered eating habits. (Cavadini et al, 2000, Chang Shu-Hui et al, 2000 and Malina et al, 1973). Body weight, BMI and body composition of a subject are also very important parameters reported in literature to influence the age at menarche (A-Awadhi et al, 2013; Banergee et al, 2007; Deo and Gattorgi, 2004 Lin-Su et al, 2002 and Mohammad et al, 2013). Thus the present study aims to evaluate the age at menarche in physically active and non

active girls and to evaluate their relationship with BMI and body composition.

2. Materials and Methods

The study was conducted on 31 physically active and 31 non active girls belonging to Punjabi University Patiala. The data was calculated for age (decimal age), height (cms) and Weight (Kgs). The body mass index was calculated by using formula:

$$\text{Body Mass Index} = \frac{\text{Body Weight (Kg)}}{\text{Height (m)}}$$

Body fat percentage was calculated using four skinfold method. Body density was calculated using biceps, triceps, suprailiac and subscapular skinfold using Durnin and Womersley (1974) method and percent body fat was calculated using Brozek et al (1963) method.

Using the retrospective method, the age of menarche was calculated. It was taken through questionnaire. The entire data were computed statistically using SPSS.

3. Results

In the present study, total 62 girls were studied, out of which 31 girls were physically non active and considered as control group and 31 were physically active belonging to different sportive events with their mean training age of 8.95 years. Table 1 shows the mean and SD values of the decimal age and menarcheal age of the subjects. It has been observed that although there is not statistically significant difference in mean values of their decimal ages of both the groups but the results of the present study shows a difference in the mean ages at menarche in them

and it is clear that the non active girls (control group girls) are early maturer as compared to their physically active counterparts and the t-values shows that this difference is statistically significant. The present study although small in number but strongly agree with the previous studies of age at menarche in athletes. (Stager, 1988 and Sidhu and Grewal, 1980).

Table 1. Mean and SD values of decimal age and menarcheal age of the control group and physically active group

Parameters	Control Group (mean \pm SD)	Physically Active Girls (mean \pm SD)	t-value
Decimal age (yrs)	17.67 \pm 1.36	17.53 \pm 1.88	0.343
Menarcheal Age (yrs)	13.053 \pm 0.44	13.98 \pm 0.496	7.78***
Training age (yrs)	-----	8.95 \pm 2.99	-----

***significant at 0.05 level

Table 2 & Table 3 shows the mean and SD values of height, weight, body fat percentage, total body fat and lean body mass of the subjects. It is clear from the results that the subjects of both the groups are of same height and the t values shows that the difference their mean height is not statistically significant. The physically inactive girls were overweight and their BMI index is towards higher range and it is also observed that the difference in body weight as well as BMI index is statistically significant with their physically active counterparts. Similar results were observed for mean values of Body fat percentage which also shows a higher range in case of physically inactive girls as compared to their physically active counterparts and the difference is again statistically significant. Table 4 shows the correlation of age at menarche with body mass index and body fat percentage which shows a positive correlation of age at menarche with that of body mass index and body fat percentage.

Table 2. Mean and SD values of Height (cms), Weight (Kg) and BMI (Body Mass Index) of the control group and physically active group

Parameters	Control Group (mean \pm SD)	Physically Active Girls (mean \pm SD)	t-value
Height (cms)	158.96 \pm 4.41	158.72 \pm 5.77	0.1844
Weight (Kgs)	58.35 \pm 3.70	49.22 \pm 6.87	36.52***
BMI	23.12 \pm 1.78	19.47 \pm 1.92	7.76***

**** significant at 0.05 level.

Table 3. Mean and SD values of Percentage Body Fat, total body fat and lean body mass of the control group and physically active group

Parameters	Control Group (mean \pm SD)	Physically Active Girls (mean \pm SD)	t-value
Body Fat percentage	21.4 \pm 1.68	19.68 \pm 2.31	3.38***
Total Body Fat (Kgs)	12.52 \pm 1.314	9.75 \pm 1.53	7.67***
LBM (kgs)	45.83 \pm 3.001	39.977 \pm 5.22	5.58***

***significant at 0.05 level

Table 4. Correlation of age at menarche with percentage Body Fat, Body mass Index of the control group and physically active group

Parameters	Control group	Physically active girls
Age at menarche vs BMI	0.25	0.29
Age at menarche vs Body fat %	-0.15	-0.18

4. Discussion

In the present study conducted in Punjabi University Patiala, Punjab it can be concluded that the correlation between BMI and age at menarche is quite high and it is the most important factor to be considered to show its impact on menarche. It can also be concluded that although the timing of puberty is related to the genetic factors, other factors such as geographical location, common health status, nutrition and socioeconomic status but all such factors are also related to the body fat and body weight of the subject thus they can influence the onset of menstruation and its progression. However, the age at menarche reported by the results of the present study for physically inactive girls is (13.05yrs) which is higher than the results available in literature. It may be contributed to the fact that there are other factors also which influence age at menarche and secular trends has also been observed by various studies available in literature (Lalys and Pineau, 2014).

The results of the present study are in agreement with that of a large study (Mandel et al, 2004) in a different population, which found an inverse correlation with BMI. The relationship between BMI and pubertal development in girls appears to be a continuum. However later on and other observations (Bralic et al, 2012; Currie C et al, 2012; Oh CM et al, 2012 & Wronka, 2010) also reported the same findings. As BMI increases through adolescence, it would be an incorrect assumption to extrapolate BMI data in adult life back to the time of menarche. We did not enquire about premature thelarche as a cause of early menarche, although it can be safely assumed that the numbers of such girls were likely to be reassuringly low.

We have used BMI as an index of body fat mass. Although a reasonable tool to estimate adiposity in the community, it is only a ratio and therefore an abstract index. One must therefore exert a degree of caution in its interpretation. Nevertheless, the use of BMI as a surrogate marker of body fat is a more refined method than simple weight measurement, which is liable to be influenced by stature. The influence of body weight on age is contentious. While inadequately balanced diets tend to delay menarche, early and late maturing girls achieved menarche at similar body weights (Frisch and Revelle, 1971), suggesting a critical weight dependency for menarche. Further it has been reported that puberty onset may be related to attainment of a particular height and weight, but that a minimum age requirement must also be met.

5. Conclusion

On the basis of the results of the present study, it can be concluded that Body mass index and Body fat percentage are significantly related to age at menarche. Higher the body mass index lower the age at menarche. The findings add to the evidence that overweight and higher body fat percentage values are contributing factors for early puberty

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