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Nutritional Status and Menarcheal Age of Rural Adolescent Girls of Salboni Block of Paschim Medinipur, West Bengal, India

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Abstract

Objectives of study:

- To study mean age at Menarche of studied population.

- To study whatever nutritional status effects mean age at menarche.

Design: This is a cross sectional study which is done on 1009 Adolescent girls who belong to Salboni block of district Paschim Medinipur of West Bengal, India. To study effect of nutrition on age at menarche, different anthropometric measurements are applied.

Setting: Data was collected from adolescent health clinic named Anwesha Clinic which is under Salboni Rural hospital, West Medinipur.

Participants: Participants are 10-19 years adolescent who are resident of Salboni (Rural) block, and belongs to agriculture based family, they are selected randomly for study.

Major outcomes: Data are collected on basis of hypothesis, menacheal age, nutritional status of studied girls who came to know from research.

Result: Among studied sample 896 girls had experienced menarche, their mean age at menarche is 11.88 years (1.23). At 10 mean height of premenarche girls is 145.88 cm, postmenarcheal girls is 146.33 cm), Body mass Index had increased progressively from 13 years to 19 years of age where overall increase was (1.89 kg/m^2) from 10 to 19 years which is statistically significant with age (F=17.3, P<0.001), Percent body fat is statistically significant with Age (F=38.7, P<0.001).

Conclusion: Nutritional status are better in Postmenarcheal girls than Premenarcheal girls, The study represents typical differential rates of positive change in different body composition measures after the attainment of menarche.

Keywords: Adolescent; Menarche; Nutritional status; Body mass index; Percent body fat

Introduction

Age at menarche is a significant indicator of growth and sexual maturation in girls [1]. Much as the secular trend in human size has been an adaptive response to a nutritionally rich environment, the receding age of adolescence and pubertal development has been an adaptive response to positive environmental cues in terms of energy balance [2].

During Adolescence, growth and nutritional status are heavily influenced by the sexual maturation process, and thus cannot be accurately assessed without knowledge of the degree of sexual maturation [3]. Nutrition influences growth and development throughout infancy, childhood and adolescence; however, during the period of adolescence that nutrient needs are the greatest [4]. Researches have been carried out in some countries one of which has showed that girls with malnutrition status would experience menarche delay compared to girls with good nutritional status [5].

Generally, the anthropometric measurements and nutritional indices were lower among rural secondary school girls than those of their urban counterparts, but height, BMI differ [6].

Menarcheal age is the most widely used indicator of sexual maturation and can be used as an indicator of female health growth and development and the capacity to reproduce. Onset of maturation and age at menarche are influenced by several factors, e.g. genetics, ethnicity, height, weight, Body Mass Index (BMI), and socioeconomic circumstances. Several studies from various developed countries worldwide have shown a systematic decrease in median age at menarche in the past 160 years [7].

Anthropometrics can be sensitive indicators of health, growth and development in infants and children. In particular anthropometry has been used during adolescence in many contexts related to nutritional status [8]. Malnutrition which refers to an impairment of health from a

deficiency or imbalance of nutrients is of public health significance among adolescents all over the world.

In USA the mean age at menarche had decreased from 14> years prior to 1900 [8] to <12.5 years due to the improvement in the health care over the past century, Age at menarche in Europe, North America and other developed countries has shown a general downward trend [9]. A study on family composition and menarcheal age was conducted by Matchock and Susan [10]. Data were collected on menarcheal age and family composition from a college population. The mean menarcheal age for total sample was 12.79. In absence of biological father, the presence of half and step brothers living in an urban environment were associated with earlier menarche. Body weight and race were also associated with menarche. The average weight, height and BMI were found to be 54 kg and 161 cm, BMI respectively. Several studies have proven that girls with higher body mass index reach their menarche earlier. However, in a publication of the USDA Centre for Nutrition Policy and Promotion March 2000; this study had revealed that variations in BMI within the normal range of 18.5-24 are not consistent with the age attained at menarche. It seems that childhood obesity may influence the menarche age, however is the food intake. This study is done to find mean age at menarche of study group and relation of mean age at menarche with percent body fat, Fat Mass, It helps in comparing with earlier mean age menarche bengalee girls also help in study of secular trends.

Materials and Method

Subject

The study area of Salboni Block is 25 km away from Medinipur town. Subjects were 10-19 years adolescent girls. The study was done on 1009 girls. For these study different types of anthropometric measurements were taken like weight, height, Height is measured by anthropometric rod; Weight was taken by weighing machine. Height was measured to the nearest 0.1 cm and weight to the nearest 0.5 kg. Each subject was weighed with minimum clothing and no footwear. Structured questionnaires were followed to know details of socio-economic status of studied adolescents. Questionnaires consist of some open ended questions to collect details of subjects for age, menarcheal age, socio-economic status. Study is done on clients of counselling centre for adolescents in Salboni rural hospital [11].

Statistical analysis

Data were entered in Microsoft excel 2007 and were analysed using SPSS 19.0 (software package for social science 19). This software help to calculate sample size among 1009 total girls 896 experienced menarche. Descriptive statistics and Anova were used wherever required to test statistical significance. Statistical significance was set at p <0.05. Technical Errors of Measurements (TEM) were within acceptable limits and thus not incorporated in data analysis. Analysis of Variance (ANOVA) is a collection of **statistical models** used to analyse the differences among group means and their associated procedures (such as "variation" among and between groups.

Result

This present study had shown age wise variation in different anthropometric variable from10-19 years age which is adolescence period i.e. growing stage and entering into puberty, girls experience menarche in this period, This study indicates that high Body Mass

index girls experience early menarche. Body fat from skinfolds gives a more direct estimate of body fat mass [11] especially more so on children and adolescents [12] and may be used in field studies. In this cross-sectional study it was shown girls with earlier onset of menarche had higher body mass and body fat mass than the other girls prior to menarche or whether these differences were constituted partially or completely after menarche.

Sample size	896
Mean Age (years)	11.88
Mode Age (years)	12
Median Age (years)	12
Standard deviation	1.239
Minimum Age (years)	9
Maximum age (years)	17
25th percentile	11
50th percentile	12
75th percentile	13
95th percentile	14
896 girls postmenarcheal girls	

Table 1: General Characteristics and Menarcheal information of studied sample.

Age range	Frequency	Percentage	Cumulative Percentage
9-9.9	12	1.3	1.3
10-10.9	129	14.4	15.7
11-11.9	220	24.6	40.3
12-12.9	308	34.4	74.7
13-13.9	153	17.1	91.7
14-14.9	51	5.7	97.4
15-15.9	16	1.8	99.2
16-16.9	5	.6	99.8
17-17.9	2	.2	100.0
Total	896	100.0	

Table 2: Age wise Frequency Age at Menarche.

Table 1 had shown general characteristics and menarcheal information which had represented that mean age at menarche girls is 11.88 (±1.23).

Table 2 had represented 308 girls experience menarche in between (12-12.9) years. In this study 5.87 % Body Fat is increasing from 10 years to 19 years. In one way Anova result had shown body mass Index increased progressively from 13 years to 19 years of age where overall increase was (1.89 kg/m^2) from 10 to 19 years which is statistically

significant with age (F=17.3, P<0.001), Percent body fat is statistically significant with Age (F=38.7, P<0.001).

Variable	10 years Mean(Sd)	11 years Mean(Sd)	12 years Mean(Sd)	13 years Mean(Sd)	14 years Mean(Sd)	15 years Mean(Sd)	16 years Mean(Sd)	17 years Mean(Sd)	18 years Mean(Sd)	19 years Mean(Sd)	F
BMI (kg/m^2)	18.28 (2.07)	19.02 (2.2)	18.58 (1.62)	18.96 (1.59)	19.65 (1.76)	19.86 (1.6)	20.05 (1.69)	20.02 (1.22)	20.16 (1.22)	20.17 (1.05)	17.3*
Percent Body Fat	18.17 (2.26)	20.21 (2.43)	20.4 (2.15)	20.63 (2.24)	21.18 (2.5)	21.41 (2.85)	22.23 (2.68)	22.41 (5.16)	22.66 (5.56)	24.04 (3.25)	38.76*
Significant difference P<0.001											

Table 3: Anova table show age wise increase Anthropometric variables of Adolescents

	Height (cm)			Weight (kg)			BMI (Kg/sqm)		
Age	Premenarche	Post Menarche	t	Premenarche	Post Menarche	t	Premenarche	Postmenarche	t
10 years	147.45 (3.58)	148.34 (3.83)	1.08	37.46 (5.75)	43.42 (3.92)	6	16.93 (1.37)	19.53 (1.74)	8.3
11 years	145.88 (4.84)	146.13 (5.08)	0.25	36.01 (3.15)	41.71 (4.16)	7.7	16.89 (1.73)	19.66 (1.42)	21.3
12 years	151.37 (4.40)	153.32 (4.39)	1.54	37.38 (3.34)	45.75 (3.39)	6.8	16.62 (1.47)	19.25 (1.31)	7.81
13 years	148.61 (2.99)	150.68 (3.80)	1.81	37.00 (2.56)	44.16 (3.47)	6.9	16.76 (1.19)	19.44 (1.32)	6.62
14 years	148.65 (3.46)	150.12 ((3.87)	1.65	36.72 (3.27)	43.39 (3.32)	8.1	15.87 (0.65)	19.98 (1.41)	8.31
Significant at P<0.0001									

Table 4: Age wise comparison of postmenarcheal and premenarcheal of anthropometric variable.

	Mean Age Menarche	Percent Body Fat	Fat Mass (kg)	Fat Free Mass (kg)	Fat Mass Index (kg/sg m)	Fat Free Mass Index (kg/sqm)
Mean age at Menarche	-	0.308**	0.451**	0.372**	0.445**	0.276**
Percent Body Fat (%)	0.308**	-	0.807**	-0.051	0.864**	-0.223**
FAT Mass (kg)	0.451**	0.807**	-	0.537**	0.935**	0.311**
Fat free Mass (kg)	0.372**	-0.051	0.537**	-	0.357**	0.860**
Fat mass index (kg/sqm)	0.445**	0.864**	0.935**	0.357**	-	0.242**
Fat Free Mass Index (kg/sqm)	0.276**	-0.223**	0.311**	0.860**	0.242**	-
**Correlation is Significant at the 0.01 level (2-tailed)						

Table 5: Correlations between Mean age at Menarche (years), Percent body fat, Fat Mass (kg), Fat free Mass (kg), Fat Mass Index (kg/sqm), Fat Free Mass Index (kg/sqm)

In Table 3 represents that age wise change in Body Mass index and percent body fat, Table 4 had shown age wise comparison of premenarcheal and postmenarcheal anthropometric characters had been shown which had presented that postmenarcheal girls were significantly higher anthropometry than premenarcheal which had statistically significant relation, Correlation of mean age at menarche with fat Mass, Fat Free Mass, percent body fat was represented in Table 5 which represents those (Fat mass, fat free mass, percent Body fat) that they have positive but weak relation with mean age at menarche which are statistically significant. Girls with early onset of menarche had higher BMI than those with late onset of menarche, Skilled labour parents' daughter mean weight is 44.54 kg but unskilled labour parent's daughters mean weight is 44.42 kg [13].

Discussion

The age at Menarche or the first menstrual period is an important maturity indicator for the assessment of the developmental status of pubertal female [14]. It is well recognised that this biological event is the outcome of a number of biological and social factors and mean menarcheal approach age appears to be particularly sensitive indicator of biosocial status of population [15]. High subcutaneous fat levels and a higher BMI at a pre-pubertal age (5-9) years are associated with an increased likelihood of early menarche (>11 years) [16]. At present it is observed that age wise mean value of anthropometric measures are increasing which shows growth spurt in adolescence period. After age 13 year BMI (kg/m^2) had steadily increased with mean age at menarche which was influenced by Body Mass index. As Body mass Index has increased progressively from 13 years to 19 years of age, but overall BMI was increasing by age (1.89 kg/m^2) in between 10 to 19 years. Percent body fat has positive correlation with mean age at menarche, which indicates percent body fat influence mean age at menarche. When present study is compared with mean age at menarche (11.88) of other Indian girls it is found that adolescent girls of Kerala have higher mean age at menarche (12.11). In most females it

occurs between her age of 10 to 16 years, however, it shows a remarkable range of variation. General improvement in nutrition and health has been suggested to explain the downward trend. The earlier onset of menarche has also been seen in developing countries like Bangladesh [17].

Conclusion

The mean menarcheal age (determined by retrospectives method) of the studied sample was 11.88 (1.23). This study had shown sexual maturation in early adolescence period in comparison with Eastern India girls and present study sample experiences their early menarche comparing to rest Indians. In global perspective the age at menarche in this study is less than most African and Asian studies but closer to most European and North American countries.

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