

A study to determine age at menarche in adolescent school girls of Indore city, M. P. India

Solanki S.¹, Soni A.^{2*}, Randa V.³, Choudhary R.⁴

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¹ Sunita Solanki, Associate Professor, Department of Physiology, MGM Medical College, Indore, Madhya Pradesh, India.


^{2*} Ajay Soni, Demonstrator, Department of Physiology, MGM Medical College, Indore, Madhya Pradesh, India.

³ Vesti Randa, Associate Professor, Department of Physiology, MGM Medical College, Indore, Madhya Pradesh, India.

⁴ Ramkrishna Choudhary, Post Graduate student 3rd year, Department of Physiology, MGM Medical College, Indore, Madhya Pradesh, India.

Background: Menarche is a significant milestone in women's life. It affects the reproductive health and well being of women. This study aims to find out the age at menarche of adolescent girls of Indore city and its relation to various factors. **Method:** This was a cross-sectional study conducted in six schools of urban areas of Indore city the study group included 492 school girls of age 11 to 18 years. After taking written informed consent from the parents, data was collected on the date of birth, family size, birth order, dietary intake, social-economic status, menarcheal age. Anthropometric measurements were done and data was analyzed. **Results:** Mean age at menarche was found to be 13.2±1.24 years. It was found to be significantly associated with socioeconomic status, BMI and birth order. **Conclusion:** The mean age at menarche in this study is comparable to that found in other Indian studies. It is found to be significantly associated with BMI and socioeconomic status of the girls

Keywords: Adolescent girls, Age at menarche, Body mass index, Indore

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Introduction

Menarche the first menstrual period is one of the most significant milestones in a women's life. It is a critical biomarker in the reproductive life of females. [1,2] It serves as an intermediate health outcome that affects the women's well-being at later stages of life.[3] The age at menarche is clinically very important in the diagnosis of delayed puberty and pathological and hormonal disorders [4]. Various factors have been postulated to affect the age of menarches like nutritional status and socioeconomic status, environment, sibling-ship, genetic factors, religion, ethnicity, psychological stress and chronic illness [5].

Early menarche is among the few established risk factors for breast cancer[6,7]. It has also been associated with metabolic syndrome [8]and overweight. [9,10] Indirectly it also causes a public health concern as it may result in earlier onset of sexual activity[11]. Depression, eating disorders and poor school performance are among the other teenage problems that have been associated with early menarche.

Various studies show a downward trend in age at menarche and its effects on reproductive health and well being of women. Not many studies have been done in India, hence this study was planned to find the age at menarche in school girls of Indore city and its relation to various factors.

Material and Methods

Place of study: Department of Physiology, MGM Medical College, Indore, MP, India

Study design: This is a cross-sectional study conducted in six schools of urban areas of Indore city, MP, India.

Sample: The study group included 492 school girls of age 11 to 18 years.

Sampling technique: The schools were selected by purposive sampling. After taking permission from the Principal of the school; teachers and girl students were explained about the importance of the study. Written informed consent explaining the nature and confidentiality of the study to be read and signed by their parents, was given.

Inclusion criteria: Only those girls whose parents gave consent were included in this study.

Exclusion Criteria: Girls suffering from chronic illness or who were on prolonged medication were excluded.

Tools and techniques of data collection: A self formulated questionnaire was administered to those students who gave consent for the study. Data was collected on the date of birth, family size, birth order, dietary intake, socio-economic status, menarcheal age and family history. Socioeconomic status was determined using the Kuppaswamy socioeconomic status scale which includes education and occupation of family head and total family income.

Following anthropometric measurements were done.

Anthropometric Measurements

- **Height:** a vertical measuring scale fixed on a wall was used. Height was measured to an accuracy of 0.1 cm. After removing the shoes, the subject was asked to stand upright on a flat floor, looking straight and with feet parallel and with heels, buttocks, shoulder and back of the head touching the wall.
- **Weight:** is a sensitive index of nutritional status. It was measured by using a portable weighing machine from Libra. Subjects were weighed to the nearest 0.1 Kg. Subjects were asked to stand straight and without shoes.
- **Body mass index (Quetelet's Index)-** is defined as the weight in kilograms divided by the square of the height in metres (kg/m²). The BMI index has the least correlation with body height and the highest correlation with independent measures of body fat. The prevalence of overweight and obesity is commonly assessed by using body mass index (BMI). "BMI- for- Age: Girls, Age 2-20 years" developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000) was used as the reference standard. BMI was plotted against the age in the chart to determine the weight status by percentile group. Subjects with 'BMI for age' < 5th percentile were considered as underweight or thin and those with 'BMI for age' ≥ 85th percentile were considered to be at risk of being overweight, while subjects with 'BMI for age' between 5th and 85th percentile were categorized normal.

Statistical analysis was done using statistical package for social sciences, version 16.0, Illinois, Chicago. ANOVA was applied to see the significance of anthropometric measures on menarcheal age. Statistical significance was assessed at $P < 0.05$ (95% confidence interval). Pearson's correlation was used to see the correlation between anthropometric measurements.

Results

A total of 492 adolescent school girls participated in this study. Data was collected and analysed. The socioeconomic and demographic profile of the participants is presented in Table-1. 93.3 % of the adolescent girls belonged to the Hindu religion. Most of the girls (61%) were from a nuclear family. The family size of most of the girls (50%) was small, with 3 to 5 members. The majority (74.8%) of the girls belonged to the lower-middle and upper-lower socioeconomic class. Out of a total of 492 girls, 349 girls had attained menarche. The majority of them (162) attained menarche between the age of 12 – 14 years, the mean age being 13.2 ± 1.24 standard deviation.

Table 1. Socioeconomic and demographic profile of adolescent girls

Age in years	Number	percentage
11+	28	5.69
12+	70	14.22
13+	76	15.44
14+	77	15.65
15+	97	19.71
16+	84	17.07
17+	48	9.75
18+	12	2.43
Religion		
Hindu	459	93.3
Muslim	15	3.05
Christian	13	2.64

Others	5	1.02
Type of Family		
Joint	165	33.54
Nuclear	301	61.18
Extended	26	5.28
Family size		
3-5	25.8	52.44
6-8	18.2	37
9-11	40	8.13
>11	12	2.54
Birth order		
1-2	285	60
3-4	127	26
>4	20	4
Socio-economic status		
Upper	38	7.72
Upper middle	84	17.07
Lower middle	154	31.30
Upper lower	214	43.5
lower	2	0.41

Table 2: Distribution of girls according to age at menarche

Age (in years)	Total No.	Percentage
10 -11	5	1.43
11 -12	17	4.87
12 -13	114	32.7
13 - 14	138	39.54
14 - 15	64	18.34
15 - 16	8	2.29
16 -17	3	0.86
17 - 18	0	0

Girls were divided into yearly interval age groups as given in Table 2. The most common age group for the onset of menarche was 13 -14 years (39.54%) however, the second most common age was 12 -13 years (32.7%). 3 cases (0.86%) had their onset at the age of 16 years. Thus, we can see that majority of the girls experienced the onset of menarche in the age group of 12 and 14 years.

Table-3: Mean 'BMI for age'

Age (in years)	<5th percentile (underweight)	5th – 85th percentile (normal weight)	85th – 95th percentile (at risk of overweight)	>95th percentile (overweight)
11+	4	9	0	0
12+	13	39	1	1
13+	20	44	0	1
14+	9	47	0	1
15+	35	61	1	0
16+	19	63	2	0
17+	7	40	0	1

18+		6	6	0	0
Total	492	139	329	10	14
	%	28.17%	66.86%	2%	3%

The mean 'BMI for age' is presented in Table 3. The overall prevalence of thinness (5th percentile weight of NCHS reference) was 28.17%. 68.86% were of normal weight. Only 2 % of girls were at risk of overweight and 3 % were overweight.

Discussion

The mean age at menarche in this study was 13.2±1.24years. Age at menarche was found to be significantly associated statistically with socioeconomic status P = 0.005 and birth order P = 0.03. On statistical analysis it was seen that BMI and age at menarche show a negative correlation and is equal to -0.4 and is significant with a p-value of 0.002. Thus, it was seen that age at menarche was earlier when BMI was higher. Obese girls had an earlier age at menarche as compared to underweight girls. Girls with lower birth order were found to have earlier menarche as compared to those who were born later that is third and fourth birth order and more than 4th birth order. Age at menarche was not found to be statistically significant with religion, family size and type of family. No other socio-economic or demographic variables were found to be associated with age at menarche.

The mean age at menarche in our study is slightly higher than the age reported by some other studies. Paria et al (12.24 ± 0.72 years) in rural and urban school girls of West Bengal [11] Barthalakshmi et al (12.9 + 1.2 years), [12], Sachan et al urban as well as rural schools of Lucknow (12.8 +1.4 years), [13] Verma et al in their study at Varanasi reported the mean age at Menarche to be 12.98+ 0. 77.[14] In a study conducted by Kshitija et al [15] lower age of menarche (10 – 12 years) was found in girls of urban areas as compared to girls of rural areas of Goa. In another study conducted by S Rokade and S. Mane[16], the mean age of menarche was 12.62 +/- 1.05 years in urban areas of Pune, Maharashtra. In another study by Rashmi et al,[17] the mean age at menarche was 13.65±1.05 years in semi-rural adolescent girls of Ambala, Haryana and the mean age of menarche was 13.44 years in a study by Vaibhav Suresh et al.[18] The age of the respondents was ranged between 13 and 16 years.

The earliest recorded age of menarche was at 12 years, and the latest age was at 15 years. In a study by Rakhee et al [19] age of menarche was found to be still higher, by both probit analysis (14.8 years) and recall method (15.8 years). It was significantly higher in rural than urban ones. This can be explained by the better socioeconomic status for urban girls than rural ones and the lack of fat for rural girls due to malnutrition.

Besides, rural girls travel long distances to school every day which may partially put them to stress and delay their menarche. The above studies have observed a sharp decline in the menarche age of women in India. The figures point towards a significant decrease in the mean age at menarche. This decline is directly associated with puberty ahead of schedule in a large section of female children experiencing early maturity and growing up earlier than scheduled has become a matter of concern.

A wide range of variation is seen in the age of menarche. The age at menarche essentially has been a function of the interplay between genetic variability, overall health/hygiene conditions, nutritional status and environmental influences across the human population in any given territory over time. However, owing to commendable improvements in the field of sanitation and hygiene, nutritional supply, public health interventions and socioeconomic advancement, the menarcheal age exhibited a secular declining trend across a human population of late with considerable variability.

This variability in the menarcheal age across subgroups of the human population follows gradients along with economic status, educational attainment, racial/ethnic differences, a rural-urban system of living, supply of nutritional/health services, and family size/number of siblings etc.[20]

Conclusion

The mean age at menarche in this study is comparable to that found in other Indian studies. It is found to be significantly associated with BMI and socioeconomic status of the girls which can be attributed to nutritional supply and environmental factors.

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