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Evaluation of health status of pre-menarcheal and post-menarcheal girls by Rohrer index in Purulia, West Bengal

Sudip Datta Banik

Departamento de Ecología Humana Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (Cinvestav), Unidad Mérida, Carretera antigua a Progreso km 6, 97310 Mérida, Yucatán, México. Department of Anthropology Vidyasagar University Midnapore, West Bengal, India. E-mail: sdbanik@hotmail.com; dattabanik@mda.cinvestav.mx. Tel: +52999 942-94-09. Fax: +52999 981-46-70.

Undernutrition in children and adolescents is a major problem in India. Age at menarche is a significant indicator of growth in girls. The present study records age at menarche, prevalence of under nutrition measured by Rohrer Index in both pre-menarcheal (n=107) as well as post-menarcheal (n = 131) girls (n = 238) aged 6.01 to 14.63 years. In this cross-sectional study, mean age at menarche is estimated to be 12.60 years. The comparative statements between these two sections indicate significant difference in height, weight and Rohrer Index. This Index indicates very high prevalence of low health profiles of the girls.

Key words: Menarcheal age, undernutrition, Rohrer Index.

INTRODUCTION

High prevalence of undernutrition in children and adolescents is an acute crisis in global point of view especially in developing countries like India. Menarche is the major indicator of growth and maturation during puberty in girls (Ohsawa et al., 1997). This also reflects the health and fertility of a population (Jones et al., 2009). Age at menarche is considered as a sensitive indicator of the prosperity of a population in biological, cultural and environ-mental perspectives (Dann and Roberts, 1993; Vienna and Capucci, 1994). Some studies from India have also reported ages of menarche (ranging between 11.6 to 12.6 years) in different ethnic groups (Rana et al., 1986; Singh and Shukla, 1992; Sen, 1994). Reports on comparative nutritional status between pre- menarcheal and post-menarcheal girls are very few from India. Most of these studies however; represented by urban and semi- urban populations (Bharati and Bharati, 1998; Rao et al., 1998; Bhadra et al., 2001, 2005).

Reports on menarcheal age among the tribals in India are much less. However, some studies in the last few years are available from Eastern India (Chatterjee et al., 2005; Basu and Banik, 2006) . The previous studies reported significant differences in anthropometric and body composition characteristics between pre and post-menarcheal girls. The post-menarcheal girls in this transitional phase of life from childhood to adolescence differ from the pre-menarcheal section with respect to their raised social responsibilities in the household and other activities. Girls of post-menarcheal section especially have biased and less privilege for food and education than their male sibs and children in the family (Chen et al., 1981; Miller, 1997). These raised our interest to evaluate anthropometrically the health of pre-menarcheal and post-menarcheal girls. Data from remote rural and tribal underprivileged societies are not commonly available. The present study is a report from a rural area in Purulia, a very remote district in the western part of the state of West Bengal in Eastern India.

MATERIALS AND METHODS

The subjects were children and adolescents representing Bengali-speaking low caste Hindus aged 6.01 to 14.63 years in two schools at Kashipur in Purulia district of West Bengal. In this region people belong to poor socio-economic levels. The families have identity cards of below poverty level (B.P.L) issued by the Government of West Bengal. There are four schools in this small village. Very few girls in this area were reported not attending schools. The school authorities provide mid-day meal to the students. The two schools were selected at random. This is a cross- sectional study and all the available students were selected from the schools. The dates of

birth of the subjects were recorded from the authentic sources like birth registration certificates and school records. Sample size for the present study was 107 pre-menarcheal and 131 post menarcheal girls (total 238).

All the subjects had no acute or chronic illness in last six months before the study and also were non-menstruating during the study. Age at menarche of girls was collected retrospectively by pre-tested questionnaires. The girls along with their mothers and/or nearest relatives were asked about the first experience of menstruation. Then the age at menarche was estimated up to nearest possible month. Written informed consent was obtained from the school authorities along with from parents and/or caregivers of the subjects. Ethical approval was obtained from the appropriate committee of Vidyasagar University before the commencement of the study. Subjects´ height and weight were measured with light clothes and bare-footed, using standard Martin's anthropometer. Standard weighing scale (Libra, New Delhi) was used to record the weight to the nearest 0.5 kg. For this present study, measurements selected were centimeter (cm) for stature or height (HT) and kilograms (kg) for body weight (BW). Rohrer Index (RI) or Index of Corpulence was computed using standard equations and classifications are done following international standards. Measurements were taken thrice at a time and the difference between the values of measurement is found to be within standard acceptable limits. The average of three measurements is considered as the final value for analysis (Lohman et al., 1988; WHO 1995; Lee and Nieman, 2007). The range variation of RI (According to Pignet, cited in Bhasin and Singh, 2004) is also mentioned in this study:

$$\text{Rohrer Index} = \frac{\text{Body weight (gm)}}{\text{Stature}^3 \text{ (cm)}} \times 100$$

Range variation

Very low	1.12
Low	1.13 - 1.19
Middle	1.20 - 1.25
Upper middle	1.26 - 1.32
High	1.33 - 1.39
Very high	1.40
Healthy range	1.2 - 1.6

Student's t-tests were performed to test for differences in mean Anthropometric characteristics between pre and post menarcheal girls. All statistical analyses were done using the SPSS (version 11.00) statistical package. For all statistical tests, p < 0.05 was taken as the significance level.

RESULTS

Mean age at menarche of post-menarcheal girls (who reported their age at menarche, retrospectively) is 151.24 ± 2.15 months (12.60 years) ranging from 9.44 to 12.67 years. Age distribution among the pre and post-menarcheal girls are found to be 6.01 to 12.30 years and 9.44 to 14.63 years respectively. Upper age limit of menarche was found to be 13 years. Table 1 represents the descriptive statistics (mean with standard deviations in parentheses) of anthropometric characteristics of pre-menarcheal (n = 107) and post-menarcheal (n = 131) girls. Significance of statistical differences of the variables between pre and post-menarcheal girls are tested by

Student's t-test. Mean age of pre-menarcheal girls (116.75 months ± 23.17 or 9.73 years) vary significantly (t = -21.17, P = 0.0001) from the post-menarcheal section (148.61 months ± 29.64 or 12.38 years). Post-menarcheal girls are taller in stature (135.86 cm ± 10.07) and heavier in body weight (28.05 kg ± 9.61) than the pre-menarcheal girls (stature 112.13 cm. ± 15.31 and body weight 17.12 kg ± 5.90) with significant (P = 0.0001) difference (t = -13.76 for stature and t= -13.24 for BW). Significant age variations (tested by ANOVA) are observed with respect to RI in pre-menarcheal girls (F = 3.91 P < 0.0001). But no significant age trend is however found in girls of all ages and among the post-menarcheal girls.

Table 2 exhibits the age difference of Rohrer Index in girls, tested by ANOVA. Significant difference observed in pre and post-menarcheal girls. In Table 3 prevalence of health status of girls tested by Rohrer Index (RI) or index of corpulence are presented. Very low health status (RI < 1.12) is found to be prevalent (61.30%) in girls (n = 238). Higher frequency (64.20%) of poor state of health (RI <1.12) is observed in post-menarcheal section in comparison with the pre-menarcheal girls (29.70%). Very less proportion of girls (16.40%) are recorded to have normal state of health (RI > 1.26 to 1.32). Only 12.90% of post-menarcheal girls are found to have normal state of health in comparison to pre-menarcheal girls (35.10%). Odds ratio (OR) with respect to sub-optimal health status (very low and low RI) of pre-menarcheal and post-menarcheal girls is 0.2825 (95% Confidence Interval, 0.1298 to 0.6147). This result implies that among girls, post-menarcheal section has a 0.2825 fold worse health condition than their pre-menarcheal counterpart.

DISCUSSION

The present short report presents age at menarche and prevalence of undernutrition and poor health status appraised by Rohrer Index among girls (n = 238) in Purulia district of West Bengal. Mean age at menarche as estimated to be 12.60 years with age ranging from 9.44 to 12.67 years that matches well with another study conducted in semi-urban region of this part of India (Bhadra et al., 2005) who has also reported it to be 12 years. But it does not correlate with the study (Chatterjee et al., 2005) that reported it to be 11.47 years among the Santals, a tribal community in Eastern India (Chatterjee et al., 2005).This information needs further verification. However, sample sizes in these two other studies were much less compared to the present one. The overall situation with reference to the comparative statement of health profiles assessed by anthropometric measure-ments of the girls in pre-menarcheal and puberty indicate that the girls are having sub-optimal health conditions.

Situation of post-menarcheal girls is even worse. However, in another study (Mahato, 2009), both boys and girls in this particular region of study are found to be

Table 1. Descriptive statistics of anthropometric characteristics in pre-menarcheal and post-menarcheal girls of Purulia.

Variables	Abbreviations	Girls (n = 238)	Pre-menarcheal girls (n = 107)	Post-menarcheal girls (n = 131)	t	p
Age (months)	AGE	134.28 (31.16)	116.75 (23.17)	148.61 (29.64)	-21.17	0.0001
Age (years)	AGE	11.19	9.73	12.38		
Body weight (kgs)	BW	26.26 (8.64)	17.12 (5.90)	28.05 (9.61)	-13.24	0.0001
Height or Stature (cm)	HT	131.54 (15.74)	112.13 (15.31)	135.86 (10.07)	-13.76	0.0001
Rohrer Index	RI	1.26 (2.16)	1.21 (0.21)	1.09 (0.11)	-9.89	0.0001

Standard deviations are given in parentheses after mean values.

Table 2. Age variation of Rohrer Index in pre-menarcheal and post-menarcheal girls (n = 238) of Purulia.

Age (years)	n	RI mean (standard deviation)
6	9	1.25 (0.46)
7	19	1.21 (0.46)
8	10	1.12 (0.35)
9	40	1.05 (0.23)
10	41	1.10 (0.23)
11	40	1.94 (10.30)
12	39	1.06 (0.35)
13	15	1.06 (0.35)
14	25	1.18 (0.71)
ANOVA	238	F = 0.50; P = 0.859
Pre-menarcheal girls (n = 107)		F = 3.91; P = 0.0001
Post-menarcheal girls (n = 131)		F = 2.40; P = 0.077

Table 3. Prevalence rates (%) of health status measured by Rohrer Index of pre-menarcheal and post-menarcheal girls of Purulia.

Health status	Rohrer Index	Prevalence rates (%)		
		Pre-menarcheal girls (n = 107) %	Post-menarcheal girls (n = 131) %	Total (n = 238) %
Very low	1.12	29.70	64.20	61.30
Low	1.13 - 1.19	24.40	14.90	13.90
Middle	1.20 - 1.25	10.80	8.00	8.40
Normal	1.26 - 1.32	35.10	12.90	16.40

Odds ratio with respect to sub-optimal health status (very low and low RI) of pre-menarcheal and post-menarcheal girls = 0.2825 (95% confidence interval, 0.1298 to 0.6147).

suffering from high levels of undernutrition. Girls having worse health condition than boys in this region might reflect less priority for education, food and nutrients compared to their male sibs and also other male members of the family. This is very common in societies of rural areas, at least in this part of the world, where a son is always preferred child than a girl in families. This scenario is also reported in some other studies (Chen et al., 1981; Miller, 1997). New data representing different ethnic groups from this part or other from India with bigger sample size and more anthropometric variables and socio-economic parameters will help us in understanding the nutritional states of the girls more precisely.

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