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Age on Set of Menarche in Females Among Rural and Urban Areas: A Cross-Sectional Study

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ABSTRACT

There are studies which substantiate increased adiposity prevalence in early puberty. Advancements in technology should be a serious matter of concern which is booming in the world on a day to day basis. The radio signals and waves are also to be thought of for this changing trend as the rural populations are comparatively less exposed to these radiations when compared with the urban population. Participant data sheet was given to the participants as hard copy and also shared through media as soft copies, wherein the participant fills in all the details in the questionnaire forms and submits to the investigator. All the participants were assigned with a unique identifier for any future references and follow-up purpose. The participant's current age, age of onset of menarche, and the year of onset of menarche were noted. The mean age of menarche in the urban and rural population for the past 5 yrs, since 2015, is shown in Table 2. There is an overall significant difference in the mean age of menarche when compared across the years with $p<0.001$ with 95% of confidence interval (-0.648, -0.389) between the urban and rural population using Student's unpaired t-test. Understanding the consequences of early menarche, effective preliminary interventions and awareness are required to revert back to the normal trend to build up healthier future generations.

INTRODUCTION

The normal age of onset of menarche in females of Indian population is between 12 and 15 yrs. A defined criterion for precocious puberty is not available as the puberty is the combination of attainment of the larche, pubarche and menarche. The precocious appearance of these stages is due to various factors such as hormonal imbalance, obesity, altered food habits, chemicals in cosmetics and sedentary lifestyle[1,2]. Stress also reported to be one of the causes of early onset of puberty[3]. The age limit for precocious puberty is changing to a lower value as the age of onset of menarche in girls is declining[4]. There has been a secular trend in the age of menarche of females at the rate of decrease of 1 month per decade since 1995[5]. Not just that, but the development of breast buds (tanner staging II) which indicates impending menarche also occurs earlier in girls and hence, there is a huge widening in between the development of breast tissues and the onset of menarche[6,7]. Girls in Southern India tend to attain earlier menarche when compared with North India[8].

Menstrual hygiene is often regarded as a multi-sectoral issue that requires an integrated action from the Department of Education, Health, Women and Child Development and Water Sanitation Hygiene (WASH)[9]. In recent yrs, we have witnessed a strengthened move by the government towards addressing this public health issue. With the launch of the National Rural Health Mission in 2005, menstrual hygiene promotion was formally included as a key responsibility of the community health workers (Accredited Social Health Activist; ASHA) followed by the implementation of menstrual hygiene promotion scheme for girls in rural areas in 2011[10]. In 2015, another milestone was achieved when the Ministry of Drinking Water and Sanitation published guidelines on MHM[11]. There has been a lot of national and international level push to address this issue through various social media platforms including the making of a film called Padman, roll out of menstrual hygiene campaigns, performing trials on eco-friendly or biodegradable menstrual products, implementing comprehensive sexuality education in schools, etc.

Over-nutrition in the urban population can trigger early puberty. Chronic primary malnutrition affects the timing of sexual maturation in adolescent period.9-11 There are studies which substantiate increased adiposity prevalence in early puberty. Advancements in technology should be a serious matter of concern which is booming in the world on a day to day basis. The radio signals and waves are also to be thought of for this changing trend as the rural population are comparatively less exposed to these radiations when compared with the urban population. Exposure to xenoestrogens from cosmetics, industrial wastes, pesticides, insecticides, etc., is high among the urban population and this has been linked to breast cancer[12]. Although the direct effect of xenoestrogens on the early menarche has not yet been studied, this factor should be found in the list of causative factors considering the pervasion of xenoestrogens in all the products of the modern world. The rural girls are less exposed to them when compared with the urban girls, substantiating one of the reasons for early menarche.

Socioeconomic status at the prepubertal age becomes another important factor for the determination of age of menarche. Requirement of micro- and macronutrients increases as the girl is approaching the age of menarche.13 Inadequate and surplus supply in the rural and urban population, respectively, could also be one of the factors for the differences in the age of menarche observed in our study.

MATERIALS AND METHODS

A total of 299 females were recruited randomly for the study, 106 girls from the rural areas and 193 girls from the urban areas. Females of the age group between 7 and 15 yrs were recruited for participation in the study. The participation was completely voluntary and written informed consent was obtained from all the participants before including them for the study. Participant data sheet was given to the participants as hard-copy and also shared through media as soft-copies, wherein the participant fills in all the details in the questionnaire forms and submits to the investigator. All the participants were assigned with a unique identifier for any future references and follow-up purpose. The participant's current age, age of onset of menarche and the year of onset of menarche were noted. Females with family history of precocious puberty were excluded from the study.

Meta-analysis was performed on four out of the eight components of school-level actions as quantitative data were available for only four of them. These four components included teacher as a source of information about MHM (before or after menarche) to girls, separate toilet facilities for girls in schools, awareness of girls on menstruation before menarche and good disposal facility for sanitary pads in schools. Pooled prevalence (PP) was estimated in a random-effects model using the RevMan version.5.3 software (Cochrane Collaboration, London, UK). Forest plots were generated to display the overall random-effects pooled estimates with 95% confidence intervals. The heterogeneity was quantified using the I2 measure and its confidence interval. We used generic inverse variance method and computation of the standard error was done using the formula: Square Root [(proportion (1-proportion) sample size].

RESULTS

There is no statistically significant difference in the BMI between the urban and rural groups [Table 1]. The number of females with age of menarche at 10, 14 and 15 yrs was less in both the groups, hence, not taken here for a comparison of BMI in those age groups. The mean age of menarche in the urban and rural population for the past 5 yrs, since 2015, is shown in Table 2. There is an overall significant difference in the mean age of menarche when compared across the years with p<0.001 with 95% of confidence interval (-0.648, -0.389) between the urban and rural population using Student's unpaired t-test.

DISCUSSIONS

Many factors are related to the early onset of puberty in the urban areas when compared with the rural areas. Our society seems to be accepting early puberty as a trend. In our study, we have found a changing trend with the urban girls having early age of menarche when compared with the rural girls. In a study conducted in South Africa, Urban and rural women attained menarche at 12.7 and 14.5 years respectively which resulted in early cessation of growth process leading to central abdominal adiposity in adulthood[17].

Another study conducted by Ameade and Garti showed earlier menarche in the urban and suburban dwellers of Northern Ghana region.18 About 10% of school-aged children, between 5 and 17 yrs of age, are over-weight or obese worldwide and Indian population, it varies between 10% and 30%.19-23 Risk of over-weight is 2 times higher and obesity is 3 times higher in non-poor women of Indian population[24]. About 23% of women in the urban India are overweight and obese when compared to only 7% in the rural India[25]. Intake of high fatty processed foods may be the cause. Obesity and sedentary lifestyle have been implicated as one of the most common causes of early menarche in girls. In our study, we found that the difference still exists even after comparing for the effect of BMI in the urban and rural females. Hence, obesity or overweight alone may not be the cause of concern for early menarche.

Another important area of consideration is the trend of early menarche in the past 5 years. This might be taken as a point of awareness among public about the rate of obesity, avoidance of processed foods, which people started adopting and also follow to certain extent. Similar group in the rural females was 48 girls attaining menarche at 13 yrs, where the normal pattern as for other years persisted. Menstrual health promotion in schools remains an issue of concern in India. Limited evidence was available on the different components of menstrual hygiene friendly school. Most of the evidence was available on two components, primarily girl's awareness about MHM and sanitation facilities in schools, leaving other components unaddressed. MHM in schools, although it was conceptualized comprehensively with different components as documented in guidelines, the data on its implementation was limited. There was a dearth of literature on education programs focusing on MHM in schools and knowledge, attitude, practices of mentors (teachers) who acted as an immediate source of information to girls. Although the data were available for the source of information about MHM (teachers), the studies on whether teachers as a source of information to girls had adequate knowledge about MHM were not available. We estimated that more than half of the girls did not have information about menstruation prior to menarche. Only 7% of girls reported teachers as a source of information for MHM. Menstruation hygiene education in school has most often being outsourced to non-governmental agencies[26,27]. Discrimination against female teachers to continue teaching in schools during periods was another example of a social barrier against menstruation. Not only did this practice disrupt the learning process, but it also perpetuated negative images among young minds and society[28].

Socioeconomic status at the prepubertal age becomes another important factor for the determination of age of menarche. Requirement of micro- and macronutrients increases as the girl is approaching the age of menarche[29]. Inadequate and surplus supply in the rural and urban population, respectively, could also be one of the factors for the

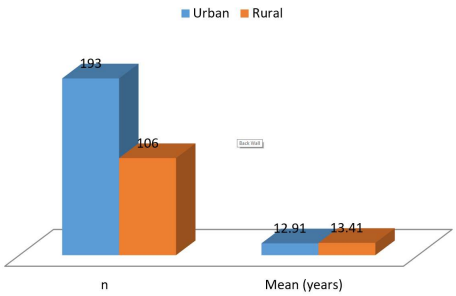

Fig. 1: Mean age of menarche

Table 1: Body mass index of the girls with age of menarche at 11, 12 and 13 years

Age of menarche (yrs)	Urban (kg/m2)	Rural (kg/m2)	p-value
11	23.1±1.84	21.2±3.61	0.586
12	24.61±3.03	20.01±0.85	0.523
13	22.81±1.36	21.71±1.69	0.734

Table 2: Mean age of menarche in the urban and rural population

Age of menarche (yrs)	n	Mean (yrs)	Standard deviation	Standard error of mean
Urban	193	12.91	0.732	0.056
Rural	106	13.41	0.543	0.040

differences in the age of menarche observed in our study. The strengths of our study are exploring the latest trend in the age of menarche in the Kanchipuram urban and rural population which was not explored by many. However, the causes should be further evaluated in continuation with the data collected in the population selected.

There is a trend of early onset of menarche in the urban females of Kanchipuram district of Tamil Nadu. Although the same has been observed in the rural population also, the number of females is considerably higher in the urban population. Sedentary lifestyle, higher incidence of obesity, exposure to fast food chemicals, junk foods and radiations could be among the general causes of this difference. Early menarche and late menopause could have effects on the physical, mental and social well-being of the women.

CONCLUSION

There is trend of early age of menarche among the females of the urban population when compared with the rural population. Understanding the consequences of early menarche, effective preliminary interventions and awareness are required to revert back to the normal trend to build up healthier future generations.

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