RESEARCH PAPER

Prevalence of Early Menarche and Associated Factors Among School-Going Girls (9–14 Years) in Chengalpet District, Tamil Nadu

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ABSTRACT

Introduction & Background: Menarche marks the beginning of puberty in girls and is an important milestone in reproductive health. The age at menarche has been declining both globally and nationally, creating public health concerns due to its link with a variety of negative health outcomes. Early menarche, defined as onset before the age of twelve, has been associated to metabolic abnormalities, psychological concerns, and reproductive challenges. The purpose of this study was to determine the prevalence of early menarche and the factors related with it among school-aged girls in Tamil Nadu's rural Chengalpet District.

Methods: A community-based cross-sectional study was carried out in four randomly chosen Thiruporur Block villages. Multistage random sampling was used to choose 365 school-age girls between the ages of 9 and 14. House-to-house surveys employing pre-tested semi-structured questionnaires were used to gather data. Both sociodemographic and anthropometric information were documented. The Chi-square and Fisher's exact tests were used to assess for associations after the data was analyzed using SPSS version 17.

Results: Early menarche occurred in 69.1% of children under the age of 12, with 5.8% having it before age 9. Early menarche was associated with characteristics such as sleep duration (p=0.000), physical activity (p=0.020), junk food consumption (p=0.000), bedtime gadget use (p=0.010), maternal age at menarche (p=0.001), and self-reported happiness and stress levels. BMI, family type, and income exhibited trends, although they were not statistically significant.

Conclusion: According to the study, early menarche is very common in the rural Chengalpet area, highlighting the impact of food practices, lifestyle choices, and psychological variables. To lessen the negative health effects linked to early pubertal onset, interventions emphasizing awareness, lifestyle change, and school-based instruction are crucial.

Keywords: Early menarche, Adolescent girls, Risk factors, Cross-sectional study.

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Introduction

Puberty is a vital physiological phase that signifies the transition from childhood to adolescence and adulthood. One of the most crucial milestones of puberty in females is menarche, the onset of the first menstrual cycle. This event marks reproductive maturity and is influenced by a variety of biological, environmental, and socio-demographic factors. According to the World Health Organization (WHO), adolescence is the period between 10 and 19 years of age, during which individuals undergo significant changes in growth, hormonal activity, and emotional development. [1]. Menarche is not merely a biological event but also a psychosocial milestone. The timing of menarche has implications on physical and mental health. Early menarche, defined as the onset before the age of 12, has been increasingly observed and is considered a growing public health concern. It is associated with an elevated risk of obesity, type 2 diabetes, cardiovascular diseases, breast and endometrial cancers, and psychological issues such as depression and anxiety [2,3]. Various studies across the globe and in India have noted a secular trend in declining age at menarche, particularly in urban and semi-urban populations [4,5]. Factors contributing to this trend include better nutrition, increased body mass index (BMI), exposure to endocrine-disrupting chemicals, early life stress, and improved living standards. However, there is a paucity

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of data from semi-urban and rural areas undergoing socio-economic transitions, such as Chengalpet district in Tamil Nadu. Understanding the local prevalence and determinants of early menarche is crucial to develop region-specific public health interventions.

This study aims to estimate the prevalence of early menarche among school-going girls aged 9–14 years in Chengalpet district and to explore the socio-demographic, nutritional, psychological, and environmental factors associated with its early onset.

Objectives

1. To assess the prevalence of early menarche among school-going girls aged 9–14 years in Chengalpet district.
2. To identify the risk factors associated with early menarche in the study population.

Materials and Methods

A community-based analytical cross-sectional study was conducted in the Thiruporur Block of Chengalpet district, Tamil Nadu, over a period of 18 months. The study population consisted of 365 school-going girls aged 9–14 years, selected using a multistage random sampling technique from four rural villages: Sembakkam, Vembedu, Madayathur, and Siruthavoor.

Inclusion criteria included school-going girls aged 9–14 years who were permanent residents of the study area and provided assent along with informed parental consent. Girls who were unavailable after three home visits or whose parents declined participation were excluded.

Data were collected using a pre-tested, semi-structured questionnaire translated into Tamil. Sections included socio-demographic information, maternal history, lifestyle factors (diet, sleep, physical activity), psychological well-being (stress and perceived happiness), and anthropometric measurements (height, weight, BMI).

Ethical approval was obtained from the Institutional Ethical Committee (IEC No: 2023/847). Data were entered in Microsoft Excel and analyzed using SPSS version 17. Descriptive statistics were used for baseline characteristics. Chi-square and Fisher's Exact Tests were applied for association analyses.

A p-value <0.05 was considered statistically significant.

Results

A total of 365 school-going girls aged 9–14 years from four rural villages in Thiruporur block of Chengalpet district participated in the study. The mean age of the participants was 12.7 ± 1.2 years. The overall prevalence of early menarche (defined as onset before 12 years of age) was 69.1%**.**

Among the biological factors assessed, higher BMI was significantly associated with early menarche ($p < 0.01$). Girls who were overweight or obese had a notably higher proportion of early menarche compared to those with normal weight. Additionally, maternal age at menarche showed a strong positive correlation; girls whose mothers attained menarche at an early age were more likely to experience early onset themselves ($p < 0.001$).

Lifestyle factors also played a prominent role. Low physical activity ($p = 0.002$**),** increased junk food consumption ($p = 0.013$), and shorter sleep duration (<8 hours/day) ($p = 0.008$) were significantly associated with early menarche. Moreover, bedtime screen use (e.g., watching TV or mobile before sleep) was more common among early-menarche girls ($p = 0.001$).

Socioeconomic factors contributed as well. Girls from higher socioeconomic status (as per modified B.G. Prasad classification) had a higher proportion of early menarche ($p = 0.04$). The type of family (nuclear vs. joint), while not statistically significant, showed a trend toward higher early menarche in nuclear families.

Psychological well-being also showed association. Girls with low perceived happiness and higher levels of stress at home were more likely to report early menarche, although these findings approached but did not reach statistical significance.

In summary, early menarche among adolescent girls in this population was significantly linked to a combination of biological predisposition (especially BMI and maternal history) and modifiable lifestyle factors. These findings underscore the importance of early interventions to address diet, physical activity, sleep, and psychosocial well-being in school-aged girls.

Table 1: Socio-demographic Profile of Study Participants

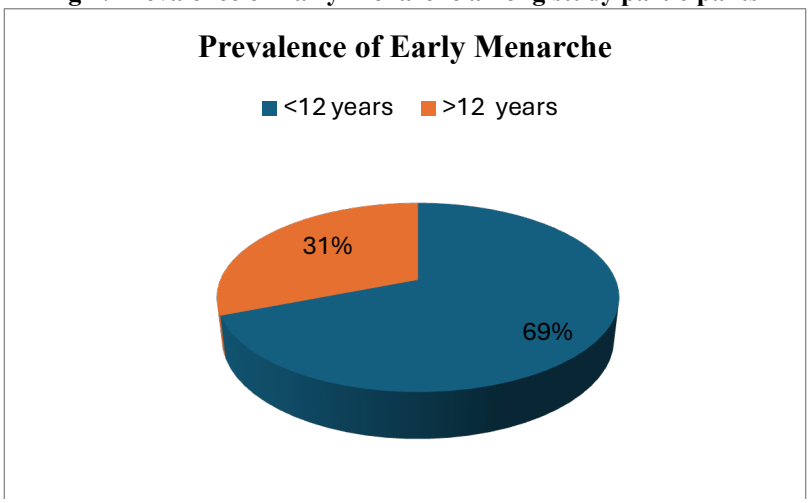
S.NO	SOCIO-DEMOGRAPHIC DETAILS	FREQUENCY (n)	PERCENT (%)
1	**Age (years)**		
	9-12	23	6.3
	13-14	342	93.7
2	**Religion**		
	Hindu	303	83.0
	Christian	41	11.2
	Muslim	21	5.8
3	**Type of family**		
	Nuclear	268	73.4
	Joint	44	12.1
	Three Generation	53	14.5

4	**Mode of delivery**		
	Normal vaginal delivery	234	64.1
	LSCS	131	35.9
5	**Socio-economic class**		
	Upper Class	8	2.2
	Upper middle Class	82	22.5
	Middle Class	111	30.4
	Lower middle Class	129	35.3
	Lower Class	35	9.1
6	**Age at menarche of mother**		
	<12	216	59.2
	>12	149	40.8
7	**BMI**		
	Under weight	39	10.7
	Normal weight	285	78.1
	Over weight	41	11.2

Table 2: Association Between Risk Factors and Age of Menarche among Study Participants

	Age at menarche(years)			**P value**
	<9	9-12	>12	
How many hours do they sleep per day (hrs)				
<8	20	100	88	0.001
8-10	1	111	21	
>10	0	20	4	
Junk food consumption frequency				
Daily	7	133	59	0.001
2-5days/week	7	23	14	
Onceaweek	3	8	17	
Rarely	4	67	23	
Physical activity participation				
Yes	10	169	88	0.020
No	11	62	25	

Fig 1: Prevalence of Early Menarche among study participants



Discussion

This study reveals a notable prevalence of early menarche among adolescent girls in the semi-urban region of Chengalpet, Tamil Nadu. The findings align with global and national trends showing a decline in menarcheal age. Early menarche is multifactorial and reflects the complex interplay of biological, lifestyle, and environmental influences.

Higher BMI and junk food consumption were significantly associated with early menarche, consistent with findings by Gemelli et al. and Karapanou et al. [6,7]. Increased adiposity is known to trigger hormonal changes that advance pubertal onset. Sedentary lifestyle and decreased physical activity further exacerbate this issue.

Psychosocial factors such as stress and low self-perceived happiness levels were also observed to correlate with early puberty, as highlighted in studies by Alcalá-Herrera et al. [8]. In addition, maternal menarcheal history emerged as a strong predictor, underlining the role of genetic predisposition.

Environmental triggers like exposure to endocrine-disrupting chemicals may also contribute to the early activation of the hypothalamic-pituitary-gonadal axis, consistent with findings by Booth et al. [9].

These results emphasize the need for community-based health education programs focused on lifestyle modifications, healthy diet, and mental well-being to delay the onset of puberty and reduce future health risks.

Conclusion

The study found that early menarche is relatively prevalent in Chengalpet district and is significantly influenced by modifiable factors such as BMI, physical activity, diet, and psychological stress. The results underscore the importance of early health education, nutritional interventions, and psychosocial support for adolescent girls. Future longitudinal studies and public health strategies are needed to mitigate the long-term effects of early puberty.

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