

A Secular Trend in Menarche Age and its Associated Factors among Adolescent Girls in India: Systematic Review

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Abstract:-

➤ *Introduction:-*

Many developing and developed countries have seen a decline in menarche age over the last century. Early menarche is linked to physical and psychological problems, and it poses pressure on the schooling of adolescent girls. The major aim of the study is to examine the best available evidence on the menstrual age trend in India and its determinative factors.

➤ *Methodology:-*

Systematic review with a narrative synthesis of the available data was done. Data sources included PUBMED, SCOPUS and Google Scholar from 2016 until 2024 published articles.

➤ *Results:-*

The selected cross-sectional studies showed the menarche age between 9 years to 16 years and the mean age reported between 12 to 14 years. A considerable number of girls from different studies attained menarche earlier than 12 years. Declining menarche was seen as more common among urban girls than the rural girls. Socioeconomic status, Body Mass Index, height, weight, lack of exercise, non-vegetarian diet, lack of sleep habits, and birth order were identified as significant factors in declining menarche. Common problems identified among the girls were dysmenorrhea, tiredness, and back pain with regards to menstruation.

➤ *Conclusion:-*

This study found a secular decline in menarche age among Indian women, as well as a variation in mean menarche age between different studies from different geographical locations with in India. Early menarche necessitates for joined efforts in early education for the adolescent school girls.

Keywords:- Menarche, Age Of Menarche, Early Menarche, Menstruation, Secular Trend, Declining Menarche Age.

I. INTRODUCTION

Menarche is the girl's journey into womanhood and the beginning of a vital stage in her life. Puberty is the stage of sexual development that occurs between childhood and adulthood. Menarche, or the first menstruation, is a watershed moment in girls' pubertal development since it marks the beginning of their reproductive capability. Menstrual age, cycle, and length play a vital role in determining the overall health of the female [1]. Still, menstruation is not well acceptable to topic to discuss openly in some parts of India. Most of the school girls are not aware of menstruation before they attain menarche.

A longitudinal study conducted in India revealed that starting menstruation prior to age twelve leads to a 13% decrease in school enrollment. Healthier girls achieved superior academic outcomes by age twelve, yet they also begin menstruation sooner and face a higher likelihood of leaving school, diminishing their initial health benefits compared to other girls in their group. Moreover, dropout rates attributed to menarche are higher [2].

A Korean study found early menarche increased the risk of Type 2 diabetes in young and middle-aged Korean women. In this, it was stressed that the importance of knowledge of age at menarche is important in identifying women at risk for diabetes [3]. A study from Kuwait reported an inverse association between age at menarche and obesity or overweight. Trends in menarche age should be monitored and time of sexual maturation and its related factors should be taken into account in strategies that aim to combat obesity [4].

The crucial age at menarche changes from one setting to another and is known to be a delicate marker of different characteristics of the population including socio-economic status, dietary status, geological area, and natural conditions. This study aims to address a huge public health concern about the changes in menarche age and the health concerns among adolescent girls. The age at menarche, which is thought to be a measure of female reproductive maturity, has significant consequences for women's health. The age and the trend of menarche are important for the healthcare team and the policymakers. This helps them to develop policies and enhance menstrual health education for schoolgirls. The studies from various parts of India are limited to the specific

geographical location. These studies included schoolgirls, teenagers, and sportswomen from a specific location, making it challenging to compare menarche ages across India or regions. It is important to investigate the menarche age patterns often to fill the gap in menarche education. Studies have reported the factors influencing early menarche such as height, weight, body mass index, and socioeconomic and demographic characteristics [5,6]. The major aim of the researcher is to examine the menstrual age trend in India and its determinative factors.

meets the eligibility criteria. The disagreements were resolved between the researchers in each step.

We included studies that: were conducted as cross-sectional studies on identifying menarche age and its associated factors, Indian based studies, the studies conducted among adolescent school-going girls, and these articles were published in a peer-reviewed journal between 2016 to 2024. The studies which are conducted within India are included. All the other international studies are excluded. The researchers excluded the case reports and other studies with small sample sizes. We also excluded studies that assessed other aspects of menarche and menstruation. The studies which were conducted before 2016 were excluded. All the included studies used the age of menarche by recall method. The studies included questions related to menstruation by finding menarche age, menstrual pattern, demographic variables, and sources of information about menarche. 9 studies met the inclusion and exclusion criteria.

II. METHODOLOGY

➤ Definition of Menarche

The first time occurrence of menstruation is called Menarche. Menarche is more than just a stage in pubertal development. Its timing, particularly when early, may be associated with a variety of health issues in adolescence and adulthood.

➤ Eligibility Criteria

The research studies included in this systematic review were through the multi-step process (Fig 1). Initially, two researchers independently screened the title and abstract of each identified article for relevance. In the next step, each researcher individually reviewed the selected article's full text for its relevance to the objective and to ensure that the article

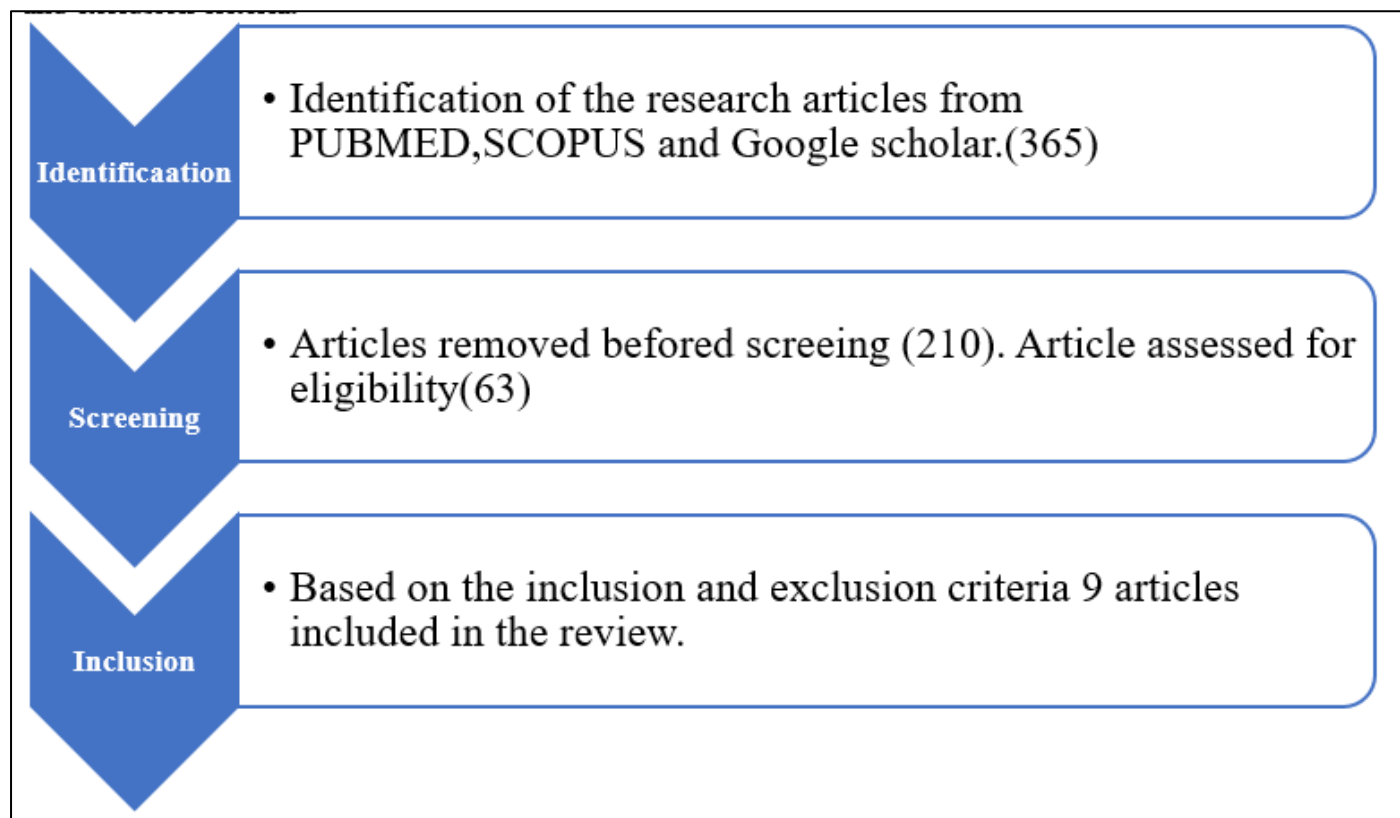


Fig 1: Flow Chart of Review Process

III. RESULTS

Table 1: Finding of Menarche and its Associated Factors

Place	Sampling (Sample Size)	Findings of study regarding menarche age
Southwestern Region of Karnataka [7]	Simple Random Sampling (700)	The mean menarche age was found to be 12.67 ± 1.19 years, with 33% experiencing it before the age of 12. High BMI, excessive exposure to audio-visual media, lack of exercise, non-vegetarian diet, and late sleeping habits identified as influencing factors.
Barabanki Uttar Pradesh [8]	Simple Random Sampling (470)	The mean (SD) age of menarche was 13.13 ± 1.23 years.
Indore city [9]	Purposive sampling (492)	The Mean age at menarche was found to be 13.2 ± 1.24 years. Significant association was found with the socioeconomic status, BMI and birth order and the menarche age.
Aligarh [10]	Systemic random sampling technique (422)	69.7% of the study population attained menarche between 12-14 years. The mean age of menarche among the school girls was 12.52 ± 1.415 . The minimum age of menarche was 9 years and the maximum age was 16 years.
Mysore [11]	536	Mean age of menarche was 13 ± 1.1 years with wide differences. Dysmenorrhea and menstrual irregularities were more prevalent. Common problem identified was tiredness and back pain.
Mumbai [12]	258	The mean age noted in this study was 12.23 ± 1.09 . This study found association of menarche with sister's menarche age, socio economic status. Declining trend in menarche seen among the urban girls.
Nagpur region, Central India [13]	Systematic sampling (622)	The median age of menarche was 14.8 years. The mean age was higher in rural than urban area. 72% of the study population reported dysmenorrhea.
Gangtok, Sikkim [14]	Simple Random Sampling (670)	Mean age of attainment of menarche was 12.52 years. Positive correlation was identified between age of onset of menarche with height, weight and mothers age at menarche and negative correlation with body mass index.
Konkan, Maharashtra [15]	813	The mean age of menarche showed $13.1 \text{ years} \pm 1.1$ years. Adolescent with late menarche had shown tinning and stunning.

IV. DISCUSSION

The data from the National Family Health Survey India revealed that the majority of the women (66.2%) reached menarche between the ages of 13 and 14 years. Less than one-fifth of them attained an early menarche (17.2%), whereas 16.7% had a late menarche. The average age of menarche for the studied women was 13.49 years. These data reported with secular decline in menarche age among Indian women, as well as a considerable variance in mean menarche age among birth cohorts [16].

Cross-sectional studies from India in India reported the mean (SD) age at menarche as 12 to 14 years with the following results: 12.52 ± 1.415 out of 422 respondents aged 10-19 years [Aligarh] [10], 13.13 ± 1.23 years in 470 girls [Barabanki] [8], 13.2 ± 1.24 years 492 girls aged 10-19 years [Indore City] [9], 13 ± 1.1 years in 536 girls aged 10-19 years [Mysore] [11], 12.23 ± 1.09 258 girls aged 13-18 years [Mumbai] [12], 14.8 years in 622 girls [Nagpur] [13], 12.52 years in 670 girls [Gangtok] [14], and $13.1 \text{ years} \pm 1.1$ years in 1071 school girls aged six to 17 years [Konkan] [15]. A recent study from Karnataka reported earliest reported age of first menstruation was 8.67 years, while the latest reported age was 16.17 years. Similarly, the declining trend was also noted in the international studies from Bangkok [17].

When compared to school girls from different study areas of India, it is comparable to those of Mumbai (mean age 12.23 ± 1.09), Aligarh (mean age 12.52 ± 1.415), and Gangtok (12.52) years but these studies reported lower age than that of girls other study areas [10, 12, 14]. This may be attributed to differences in environment and food habits in different parts of India. Increased Median age of menarche was reported from Nagpur. Analysis in a study from Nagpur showed that the menarche age was found higher than similar previous studies conducted in other parts of India [13]. A study from Gangtok, Sikkim reported Menarche was earlier in girls belonging to lower socioeconomic classes ($P < 0.001$). The peak incidence of menarche was noticed in the winter months in this hilly area. Diet, ethnicity, and sibling order did not show statistically significant effects [14]. The Indian-based studies reported less awareness of menstruation before the menarche [10]. A study from Aligarh reported that the major source of information regarding menarche was mother and sister and late birth order in the family significantly increases the age of menarche [10]. In the same study, the menarche age was reported with the lowest age of 9 and the highest age of menarche at 16 [10]. Contrastingly a study from Indore reported lower birth order with the earlier menarche [9].

The age of menarche increases along with an increase in family size. A significant difference was noted between the socioeconomic class 1 (12.30±1.37years) & Class 5 (13.55±1.58) years respectively with the mean age of menarche [10]. Similarly, other studies also reported the significant influence of socioeconomic status on the menarche age [9]. Higher socioeconomic class was strongly associated with earlier menarche [12].

Girls with obesity had earlier menarche than girls with low BMI [13]. Similarly a negative correlation was seen between BMI and age at menarche (r=-0.155) in a study conducted in Gangtok, Sikkim [14]. In the same study, a positive correlation was observed between the menarche age of the study population with the menarche age of mothers. The mean age at menarche was, significantly, 0.3 years younger for urban girls compared to rural girls [13]. However,

no significant association was reported between dysmenorrhea and the age of menarche [13] and large family size increases the age of menarche [14]. Higher numbers of children in family size also result in higher age. Studies have reported a higher percentage of participants with dysmenorrhea [11, 13]. A study from Mysore reported menstrual irregularities in early adolescence [11]. The most common symptom present in adolescent girls during menstrual periods was tiredness (50.1%), and the second most prevalent symptom was back pain (27.6%) [11].

A study from Mumbai reported a significant association between menarche age with the sister's menarche age [12]. Excessive media exposure, obesity, lack of exercise, a non-vegetarian diet, and late bedtimes are key predictors of early menstruation in a study from southwestern Karnataka [7].

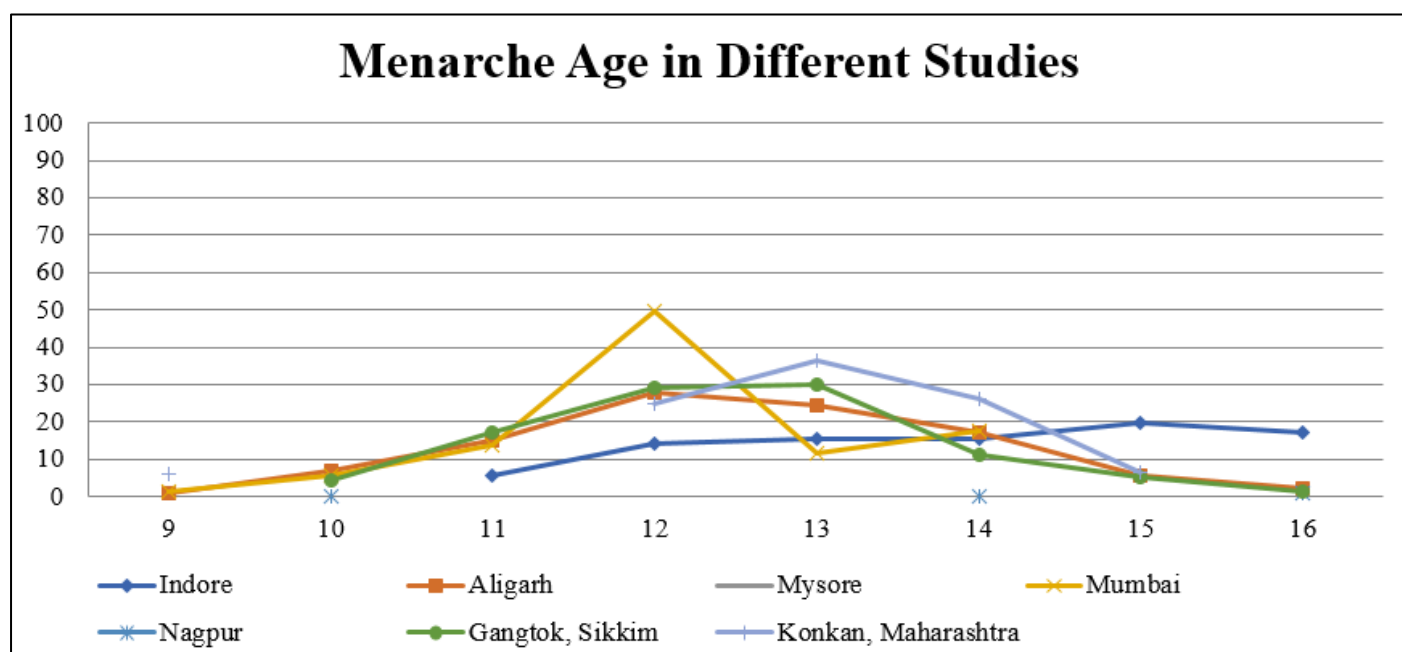


Fig 2: Percentage Distribution of Age of Menarche among the Indian Studies

Menarche age varies different parts of India. Declining trend is noted predominantly. The variations determined by various factors such as biological, environmental factors, socio economic factors, dietary factors and general health of the female child. These factors lead to secular decline in menarche age.

V. LIMITATION

The selected studies used the recall method and also study population included was predominantly school girls, so there is a possibility of sampling bias.

This study gives a clear idea of the menarche age trend and associated factors. Some of the major factors associated with menarche age were the mother's age, BMI, Socioeconomic status, environment, birth order, family size, and sibling order.

VI. CONCLUSION

This declining trend necessitates the importance of conducting research studies to investigate factors associated with it. This finding emphasizes the importance of raising awareness about early menarche and putting more effort into preventive measures for menstrual problems.

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