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ASSOCIATION OF NUTRITIONAL STATUS WITH MENARCHE : A SYSTEMATIC REVIEW

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Abstract

Menarche is the process that takes place when the hypothalamic-pituitary-ovarian (HPO) axis matures. This maturation is dependent on adequate hypothalamic and pituitary function, normal female reproductive anatomy, normal nutrition, and the absence of other long-term disorders. When a woman's reproductive health and overall wellbeing are normal, it is a sign that they are not abnormal. However, the substantial decline in the age at menarche that occurred between the early 19th century and the middle of the 20th century was associated with a significant improvement in nutrition and living conditions brought about by the process of modern civilization. Although genetic factors are responsible for approximately 50–80% of the variation in puberty onset age and milestones, environmental factors also play a role. This article demonstrates that individuals with a poor dietary level reach menarche at a later age. Girls have a greater chance of gaining weight if the foods they consume are high in fat and the nutrients that originate from animal products. It is possible for it to enhance levels of the hormone estrogen, which then supports elevated levels of cholesterol. This cycle continues until the desired effect is achieved.

Keyword: *Estrogen; Cholesterol; Hypothalamic-Pituitary-Ovarian (HPO); Menarche; Nutritional status*

INTRODUCTION

Menarche is the name given to the first menstrual period that an adolescent experiences. It occurs late in the process of puberty and is a significant indicator of one's level of sexual maturity. This significant event normally takes place within two to three years of the beginning of puberty, and it is marked by thelarche, which is represented by the formation of the mammary bud.[1,2]

In terms of the age range, the onset of menarche typically takes place between the ages of 12 and 13 years.[3] Approximately 50–80% of the variation in puberty onset age and milestones is determined by genetic factors; however, the substantial decline in the age at menarche between the early 19th century and the middle of the 20th century was associated with a significant improvement in nutrition and living conditions brought about by the process of modern civilization.[4,5]

Since the 1960s, there appears to have been a leveling off of the general trend toward younger ages at the onset of menarche. On the other hand, in the course of the previous two decades, there has been a pattern of early menarche, particularly in nations that are still in the process of building their economies. According to a number of studies, a greater increase in weight and body mass index (BMI) during childhood is associated with a beginning of puberty at an earlier age. Hence, these are the criteria that decide how old a girl is when she starts having periods.[6]

Menarche occurring at a younger age than normal has been linked to a variety of negative health outcomes, such as an increased risk of developing breast cancer, cardiovascular disease, and overall mortality.[7,8] This article discusses the association of nutritional status with menarche.

METHODS

Protocol

This study followed the guidelines of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 project for data collection, processing, and reporting. The creation of the adopted regulations was based on these elements.

Eligibility Criteria

The purpose of this literature review on the association of nutritional status with menarche. These are the main issues raised by the current research. 1) In order to be considered for publication, articles must always be written in English and emphasize the association of nutritional status with menarche. 2) For this evaluation, articles published after 2015 but before the period of this systematic review were considered. Editorials, submissions without a DOI, reviews of previously published articles, and entries that are substantially identical to those in the journal will not be included in the anthology.

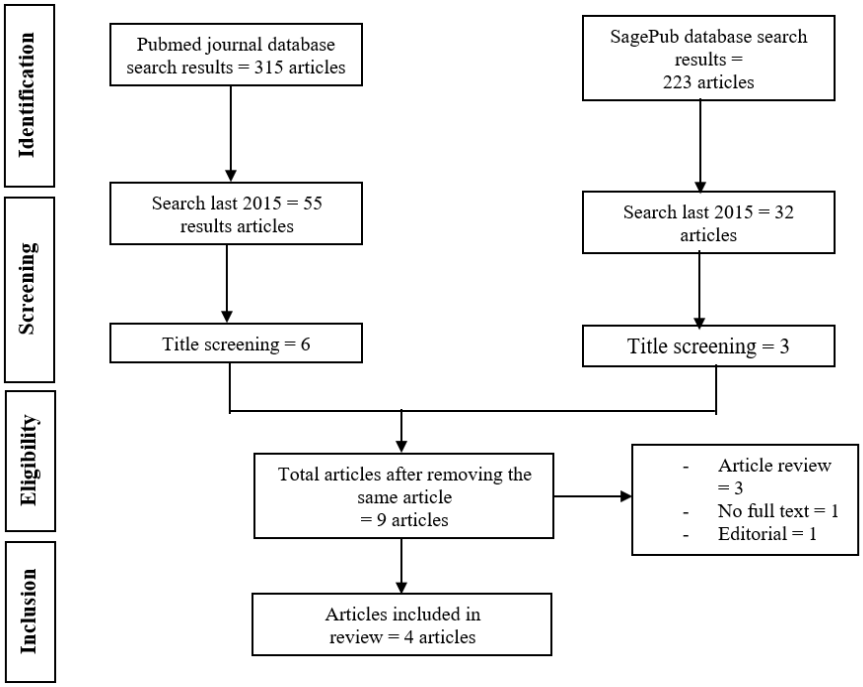

Figure 1. Article search flowchart

Search Strategy

The search for studies to be included in the systematic review was carried out from March, 12th 2023 using the PubMed and SagePub databases by inputting the words: “nutritional status” and “menarche”. Where *("nutritional status"[MeSH Terms] OR ("nutritional"[All Fields] AND "status"[All Fields]) OR "nutritional status"[All Fields]) AND ("menarch"[All Fields] OR "menarchal"[All Fields] OR "menarche"[MeSH Terms] OR "menarche"[All Fields] OR "menarcheal"[All Fields] OR "menarches"[All Fields])* is used as search keywords.

Data retrieval

The authors assessed each study's eligibility based on its abstract and title. The authors then chose historical literature as their main source. After reviewing many studies, all of which led to this conclusion, English-only, unpublished contributions are required. Only eligible studies were included in the systematic review. This restricts search results to query matches. After then, the research will be scrutinized. The study analysis revealed names, authors, publication dates, location, study activities, and parameters. After putting search results into an EndNote file, duplicate articles were removed from the database. Two reviewers examined each paper's title and abstract to determine its relevance to this study.

Quality Assessment and Data Synthesis

Before deciding which papers to dig deeper into, each author looked at the research listed in the title and abstract of the publication on their own. The next step will be for us to look at all of the papers that meet the review's criteria and should be included. When we're done with our research, we'll choose the relevant research papers for the review. Based on this rule, the manuscripts that will be looked at will be chosen. As much as possible, the process of choosing articles for further review should be made as easy as possible. Which earlier studies were done, and what about them made it possible to include them in the review, if any?

RESULT

Barros, et al (2019)[9] conducted a study with 73,624 students were assessed, including 40,803 girls, 37,390 of whom reported menarche at an average age of 11.71 years and a median age of 12.41 years. In overweight and obese girls, the median age at menarche was younger ($p < 0.001$). Excess weight (HR=1.28; 95% CI = 1.21-1.36; $p < 0.001$) and attending a private school (HR=1.06; 95% CI = 1.02-1.10; $p = 0.003$) were found to be associated with menarche in the multivariate analysis.

Jansen, et al (2015)[10] conducted study and they showed there was an estimated drop of 0.54 years per decade ($P < 0.001$). This drop was only seen in girls from cities, and it was more noticeable in girls from richer families than in girls from poorer families. Child height and BMI, maternal BMI and education, and family wealth were all related to menarche age in a way that was not positive. On the other hand, food insecurity and the number of children in the home were related to menarche age in a way that was positive.

Study in Mexico City and Xalapa estimated mean age at menarche was 11.40 and 11.34 years, respectively. There were statistically significant differences in the age at menarche among women born in the investigated decades. Women born in the 1990s or later reported a younger age at menarche compared to those born between the 1940s and 1980s ($P < 0,001$).[11]

Table 1. The litelature include in this study

Author	Origin	Method	Sample	Conclusion
Barros, 2019[9]	Brazil	Multicenter, school-based, country-wide, cross-sectional study	37,390 students	The purpose of this study was to determine the average and median ages at which menstruation began and ended in Brazil. When compared to their slimmer peers, overweight adolescents entered puberty earlier, even when controlling for other characteristics.
Jansen, 2015[10]	USA	Cross-sectional study	15,441 girls	There is a continuing downward trend in age at menarche in Colombia, particularly among those that are most likely to gain from socioeconomic development. This trend is most pronounced in young women.
Marfan, 2016[11]	Mexico	Cross-sectional survey and secondary data analyses	1,823 female students	It was found that women who were born in different decades reached menarche at significantly different ages. These differences were statistically significant.
Samaržija, 2020[12]	Croatia	Cross-sectional study	208 girls	According to the findings, there are distinct variations in the nutritional status indicators of young women depending on their level of maturity. It is possible that an improved nutritional status and a higher percentage of body fat are both markers of the quicker developing pace and a factor in the earlier beginning of menarche.

Samaržija, et al (2020)[12] conducted a study with comparison to non-menstruating girls, menstruating girls have significantly higher body mass (43.42 ± 8.31 kg vs. 38.64 ± 8.33 kg), waist circumference (68.10 ± 9.86 cm vs. 62.22 ± 7.16 cm), hip circumference (80.81 ± 7.24 cm vs. 76.63 ± 7.7 cm), BMI (19.70 ± 3.42 vs. 17.74 ± 3.10), body fat% (28.05 ± 7.54 vs. 21.98 ± 7.67) and WHR (0.84 ± 0.06 vs. 0.81 ± 0.05) in comparison to non-menstruating girls, while non-menstruating girls have significantly higher PA level (2.93 ± 0.57 vs. 2.68 ± 0.57).

DISCUSSION

Menarche happens when the hypothalamic-pituitary-ovarian (HPO) axis matures and depends on normal hypothalamic and pituitary function, normal female reproductive anatomy, normal nutrition, and the lack of other long-term illnesses. It is a sign that a woman's reproductive health and wellness are normal.[1] Most girls know that menarche is a big sign that they can have children. Menarche occurs 2-3 years after thelarche and six months after peak height velocity. PHV is the peak velocity during pubertal development.[13,14]

Around 98% of girls will have undergone menarche by the age of 15, signifying the maturity of the teenage female body. Menarche is frequently connected with the ability to ovulate and reproduce; however, neither ovulation nor fertility are guaranteed by the commencement of menarche. During adolescence, menstrual periods are typically erratic, particularly

between the first and second cycle.[15,16] Menarche is termed early if it occurs before or at age ten, and late if it occurs at or after age fifteen. Menarche is also considered delayed if more than three years pass between thelarche and the first menstrual period.[17,18]

The mean age at menarche that was reported in Barros, et al (2019)[9] study was also comparable to the mean age at menarche that was identified in a study conducted in Mexico. The study indicated that in Mexico City,[11] the mean age at the occurrence of menarche in students aged 8–17 years was 11.4 years. Likewise, the median age at which menarche occurred in this study was 12.41 years, which was close to that observed in a Colombian study (12.6 years), which was a countrywide survey with 15,441 adolescents between the ages of 10 and 18 years old.[10]

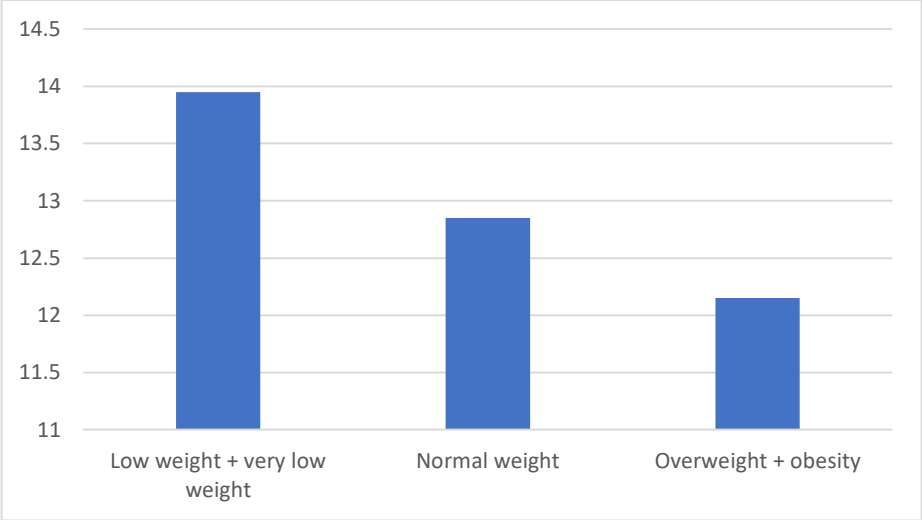

Figure 2. Comparison of menarche age between nutritional status groups

This article shows that those with poor nutritional status have an older menarche. Girls are more likely to put on weight if they consume diets high in fat and nutrients that come from animal products. It is possible for it to raise levels of the hormone estrogen, which in turn promotes elevated levels of cholesterol. It is not just the fat from the variables that make up the body composition that causes this, but also the food consumption and the lack of diseases that weaken the body.[19,20]

Respondents whose nutritional status is at the below level will experience menarche at the slow level of age. Respondents whose nutritional status is at the normal level will also experience menarche at the normal age. Respondents whose nutritional status is high or above normal will experience menarche at the fast level of age. Respondents whose nutritional status is normal will also experience menarche at the normal age.[20,21]

When nutritional health improves, the likelihood of reaching menarche is reduced, suggesting that a delayed menarche may be an indication of malnutrition. A higher body mass index is associated with a later onset of menarche. There is a connection between having a high body mass index (BMI) and having reached menarche, and there is also a connection between being obese at a young age and having reached menarche at a young age. Girls who reached menarche at a younger age had a higher body mass index (BMI) than those who did so at a later age.[22,23]

CONCLUSION

This article indicates that malnourished people menstruate later. Animal-product-rich diets make girls gain weight. It may increase estrogen, which raises cholesterol.

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