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Early age at menarche and mortality

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Core tip: Menarche is the end of childhood and start of reproductive years for each woman.

The mean age at menarche is declining worldwide in recent decades. Early and late menarche age could affect the health of adolescence and adulthood. It seems that early menarche age could have more consequences than late menarche age on mortality from different diseases.

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Menarche is the end of childhood and start of reproductive years for each woman which is preceded by a complex process of some hormonal changes in the puberty period. The mean age at menarche (AAM) is different across the world; for example about 12 years in Iran (1), about 13 years in the Netherlands (2) and 12.8 years in the United States (3). Furthermore, the mean AAM has been declined in recent decades (4,5). For example, AAM has been declined with a continuous secular trend in earlier AAM and even much earlier among immigrant girls in the Netherlands between 1955 and 2009 (2).

Many factors may be associated with early or late AAM such as lifestyle and general health (6), socioeconomic situation (7), physical activity (8) and nutritional status (9). The factors related to prenatal and childhood growth may have more substantial effects on menarche than ones related to adolescence through body weight and high animal protein intake (10). AAM could be an important predictor of mortality later in life, maybe due to the effect of sex hormones on the biologic aging (11). In addition, there is a U-shaped relationship between AAM and vascular disease risk considering both early and late menarche increasing the risk (12). Furthermore, earlier AAM may increase the risk of ovarian cancer, while the late AAM could decrease the risk of this cancer by 15% (13). There is also some evidence that AAM later than 18 years could increase the mortality rates as well (14). Malnutrition can delay AAM by about three years too (15).

It is debated that earlier AAM is related with mortality later in life (16,17) as well as higher all-cause mortality

(16,18), total mortality (14,19), cardiovascular mortality (18-20), stroke mortality (19) and cancer mortality (18). Mean AAM could vary based on socioeconomic status, ethnicity, living situations and many other factors, and thus is different between populations across the world. The menarche age ranges from 8 to 16 in developed countries (21). It has been suggested that by each year later menarche age, there is a reduced risk of overall mortality of 4.5% and 2.4% (14,19). It is found that early AAM was associated with higher cardiovascular risk factor levels later in life as well (22). Physical activity was also found to be associated with delayed menarche and reduced mortality (23-25). Based on "life history theory", in risky life situations, there would be earlier AAM, to maximize the probability of living longer and more productive (26). Moreover, body mass index (BMI) and increase in BMI before menarche could cause early menarche (27). Early AAM might protect women from hip fracture mortality later in life as well (28). It has been reported that women with earlier AAM may have lower lung function and more asthma symptoms than others, maybe due to the factors tending earlier AAM (29).

Considering the above-mentioned findings, it seems that early AAM is more important than late AAM. It means that better understanding of the process of puberty and related factors could help to prevent the consequences of early AAM and its effects on the future mortality later in life. Controlling the BMI in childhood might delay AAM.

Author's contribution

MA is the single author of the paper.

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Conflicts of interest

The author declares no conflict of interest.

Ethical considerations

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