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Age at menarche and vitamin D; a new perspective of an old problem

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Core tip

Vitamin D deficiency (VDD) is associated with some chronic diseases like diabetes, some types of cancer, cardiovascular risk, neurological disorders and autoimmune diseases. It is common among children and adolescents, even in countries with enough sunlight, especially in low-income groups. The relation between vitamin D and early age at menarche has been approved.

Vitamin D and calcium are metabolically interrelated and highly correlated dietary factors and may have a protective effect against breast cancer (1). Vitamin D has an important role in bone metabolism and renal calcium absorption (2). Inadequate levels of vitamin D and calcium during puberty could impair the process of skeletal growth and optimization of bone mass (3). It has been reported that adequate consumption of vitamin D in childhood can increase the high-density lipoprotein cholesterol (HDL-C) levels and decrease the low-density lipoprotein cholesterol (LDL-C) levels in adolescence and prevent cardiovascular diseases (4). Thus, an inexpensive intervention such as a vitamin D supplementation in prepubertal children with a diet including enough calcium is necessary to increase the whole body and regional bone mineral content (5).

Vitamin D deficiency (VDD) is associated with some chronic diseases like diabetes, some types of cancer, cardiovascular risk, neurological disorders and autoimmune diseases (2). VDD is common among children and adolescents, even in countries with enough sunlight, especially in low-income groups (5). VDD is mainly prevalent among adolescent population during the school years (3). Moreover, although VDD has no significant negative association with the muscle mass development during puberty in girls, the observed temporary negative influence of vitamin D on muscle mass development might be due to faster growth before menarche which is diminish after menarche (6).

There is a wide variability in age at menarche (AAM) between populations due to different environmental and socioeconomic status (7, 8). Increase in mean AAM before the industrial revolution (9,10) and its decrease in recent decades (11,12) may demonstrate the fact that the initiation of puberty might be responsive to environmental changes. AAM is regulated by genetical and environmental factors (13) which its timing is determined mainly by genetics (14). There are some common genetic factors of the timing of puberty and bone acquisition with similar effect by environmental factors such as VDD (15).

The timing of puberty may have substantial implication in clinical, public health and social perspectives (16). In some studies (17) but not all (18), it has been suggested that breastfeeding may delay AAM. Different factors can be associated with the timing of puberty and further earlier AAM such as low-birth weight (19), socioeconomic status through nutrition and health (20), maternal VDD in pregnancy affecting on the adiposity of children (21), season of birth (22) and calcium, magnesium and phosphorus provided from dairy (23). There is also a significant positive correlation between AAM of mothers and their daughters (24).

Early AAM is associated with higher risk of some diseases such as type 2 diabetes, cardiovascular diseases and endometrial and breast cancers (25,26), although some studies suggested vitamin D supplements only for increasing survival in breast cancer patients with no effect on prevention of disease (27). It is also related to some behavioral and psychological risk factors during adolescence like smoking, alcohol consumption, earlier sexual activity and teenage pregnancy (16, 28). The association between earlier AAM and higher adiposity in girls has been reported too (29,30).

The relation between VDD and early AAM has been approved (2,31). In fact, VDD is more prevalent among children with earlier AAM (32) and girls with early puberty (33). There is also evidence that despite less vitamin D intake in preschool children, their vitamin D status was satisfactory, suggesting that Estimated Average Requirement (EAR) value is too high to show the external intake of vitamin D (34). However, it should be mentioned that a single measurement of vitamin D cannot reflect the real situation of VDD of an individual in a long period of time (35).

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MA is the single author of the manuscript.

Conflicts of interest
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Ethical considerations
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