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## Early age at menarche and cardiovascular disease

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**Core tip:** Both early and late age at menarche have effects on cardiovascular diseases (CVDs) through metabolic syndrome and body mass index. Earlier age at menarche can increase the risk of CVDs.

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Cardiovascular diseases (CVD) are the leading cause of death worldwide (1). It is believed that women have less mortality from CVD because of estrogen hormone. One of the factors affecting on this situation could be earlier age at menarche (AAM) among girls with showing its effects later in life. AAM, is considered as a substantial developmental stage of every girl, in both aspects of social and medical. It is, in fact, the initiation of process of ability of reproducing. The starting time of menarche is identified by environmental and genetic factors (2). Therefore, age is an important metabolic risk factor and positively associated with a reproductive process (3).

Moreover, metabolic syndrome is a combination of metabolic risk factors for CVD including insulin resistance, obesity, dyslipidemia, hyperglycemia and hypertension (4). The relation between obesity and early AAM is, in fact, a complex association, while obese girls may enter to puberty much earlier than others. Early menarche is associated with the increase body mass index (BMI) in adulthood and further complications such as CVD (5).

There is evidence that the timing of menarche has an influence on cardiovascular and metabolic situation of girls (6). Both early and late AAM are indeed correlated with increased risk of CVD, with a U-shape relationship (7). In addition, earlier initiation of menarche among girls was related to unfavorable vascular changes in metabolic risk factors (3) and early AAM has been associated with metabolic syndrome and many CVD risk factors (6). Some (8,9) but not all (10) prospective studies found a relationship between early AAM and increased risk of CVD. In different populations, it has been approved that early AAM is associated with increased BMI in adulthood (3).

Several studies have reported a relationship between early AAM and CVD (9) or stroke (8) but with some debate (11). There is evidence that early AAM is related to increased risks of CVD morbidity and mortality as well as overall mortality in women, which may be partly mediated by raised BMI (12). It means that history of early menarche could help to find women with potential increased risk of CVD morbidity and mortality.

In fact, AAM has been proved to be associated with CVD, especially earlier AAM (13, 14). In addition, with the initiation of sexual maturation, systolic and diastolic blood pressures could increase too (15). It has also been reported that CVD risk factors can be active in girls with earlier AAM (6). Moreover, there is evidence that earlier AAM among girls, might be led to worse CVD risk factor levels in adulthood (16) as well as increasing the risk of ischemic heart disease and stroke (10). There is also a recommendation that preventing obesity in girls before puberty is much more effective than focusing on early menarche (17).

It is believed that generally by increasing each year of AAM, the risk of CVD will decline (12, 13, 18). In a study published in 2004, a 3% lower mortality from all causes for each increasing year of AAM was detected (11). With a U-shape relationship between AAM and CVD (19).

### Author's contribution

MA is the single author of the paper.

### Conflicts of interest

The author declares no conflict of interest.

### Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by

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