Mother's body size and placental size predict heart disease in men

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Researchers investigating the foetal origins of chronic disease have discovered that combinations of a mother's body size and the shape and size of her baby's placenta can predict heart disease in men in later life. The research is published online today in the *European Heart Journal*.

Professor David Barker and colleagues studied 6975 men born in Helsinki (Finland) between 1934-1944 - a time when not only was the babies' size at birth recorded but also the size of the placental surface. Other available information included details of the mothers' height and weight in late pregnancy, age, parity, and date of last menstrual period.

They found that there were three combinations of mother's body size and placental shape and size that predicted coronary heart disease in boys when they reached late adulthood (from about aged 40 onwards):

1. An oval-shaped placental surface in short mothers who had not been pregnant before - the narrower the placental surface in relation to its length, the more the risk of heart disease rose, increasing by 14% for each centimetre increase in the difference between the length and breadth of the surface.

2. A small placental surface in tall, heavy women (those with a body mass index (BMI) over 26 kg/m^2, the middle value for the women in the study); in these men their risk of heart disease rose by a quarter (25%) per 40cm2 decrease in the surface area.

3. A large placental weight in relation to birthweight in babies born to tall mothers with a BMI below 26 kg/m^2; these men had a seven percent increased risk for every one percent larger ratio of placental weight to birthweight.

The associations were independent of the social class of the men or the family into which they were born.

Prof Barker, who is Professor of Clinical Epidemiology at the University of Southampton (UK) and Professor in Cardiovascular Medicine at Oregon Health and Science University (USA), has already discovered that there is a link between placental weight and heart disease in later live, but placental weight does not indicate the size of the surface that is available for absorbing and delivering nutrients for the growing baby. "Due to the fact that the shape and size as well as the weight of the placenta were routinely measured at the birth of this group of men, we have been able to show for the first time that a combination of the mother's body size and the shape and size of the placental surface predicts later heart disease," he said.

For each of the three combinations, the babies that developed heart disease in later life tended to be thinner than average, which indicated that they were undernourished at birth.

Prof Barker said that he thought the explanation for the first combination (oval placental surface in women who have not been pregnant before) is that "an oval placental surface is an indication that the implantation of the placenta was disrupted in early pregnancy, leading to foetal under-nutrition, which, in turn, programmes coronary heart disease in later life". The mechanisms that may play a role in disrupting the implantation of the placenta are not yet fully understood.

For the second combination (small placental surface in tall, heavy women), Prof Barker said: "Although the mother is tall and has a BMI of over 26 kg/m^2, indicating that she was well-nourished at the time of her pregnancy, placental growth depends on the structure and function of the mother's uterine wall, which is established during her own foetal life. Therefore, her own foetal experience necessarily affects placentation in her offspring. Foetal growth depends on the availability of nutrients. Restricted placental growth may, paradoxically, have a greater effect in babies who are growing rapidly because their mothers are well-nourished. We think that these babies were able to grow rapidly at first, but the small placenta started to restrict their growth mid-gestation, so that by the time they were born, they were under-nourished."

For the third combination (large placental weight in relation to birthweight in babies born to tall women below the average weight), Prof Barker believes the explanation lies in what the mother ate during pregnancy. "Tallness indicates good nutrition before pregnancy, but their low body mass index indicates poor nutrition during pregnancy," he said.

Prof Barker says that this research is further evidence of the long-term effect of foetal development. "Chronic disease is the product of a mother's lifetime nutrition and the early growth of her child. It is not simply a consequence of poor lifestyles in later life. Rather it is a result of variations in the normal processes of human development."

Now the researchers plan to study the diets and body characteristics (body size and shape, fat and lean mass) of pregnant women, the growth patterns of their babies before birth using ultrasound, and the placentas of their offspring. They hope to discover the links between the mother, her baby's placenta and the development of the baby's cardiovascular system in ways that lead to poor liver and vascular function - two of the primary culprits for heart disease in later life.

More information: "Mother's body size and placental size predict coronary heart disease in men". European Heart Journal. doi:10.1093/eurheartj/ehr147

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