# Obese 3-year-olds show early warning signs for future heart disease (w/ Video)

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A study by University of North Carolina at Chapel Hill researchers found that obese children as young as 3 years old have elevated levels of C-reactive protein, a marker of inflammation that in adults is considered an early warning sign for possible future heart disease.

In addition, the study found elevated levels of two other inflammatory markers - the ratio of ferritin/transferrin saturation (F/T) and the absolute neutrophil count (ANC) - in obese children. Elevated F/T levels started at age 6 and elevated ANC levels were found starting at age 9.

"These findings were a surprise to us," said lead author Asheley Cockrell Skinner, Ph.D., an assistant professor of pediatrics in the UNC School of Medicine. "We're seeing a relationship between weight status and elevated inflammatory markers much earlier than we expected."

"Most adults understand that being overweight or obese isn't good for them," Skinner said. "But not as many people realize that it may be unhealthy for young children to be overweight."

It can be very difficult for parents to tell when their child is overweight, Skinner said. "Especially with younger children and smaller children, because they're so short it only takes seven or eight pounds to change them from being a healthy weight to being overweight," she said.

The study was published online March 1 by the journal *Pediatrics*. Skinner and fellow Department of Pediatrics researchers Eliana Perrin,

M.D., M.P.H., Michael Steiner, M.D. and Frederick Henderson, M.D. arrived at these findings after analyzing data collected as part of the National Health and Nutrition Examination Survey (NHANES) from 1999 to 2006.

Their analysis included data from 16,335 children ages 1-17 years, who were grouped into four categories based on their body mass index (BMI): healthy weight, overweight, obese and very obese. Under this scheme, a 3.5-year-old who is 39 inches tall and weighs 34 pounds would be in the healthy weight category while a child of the same age and height weighing 43 pounds would be considered very obese. In the group of children analyzed, nearly 70 percent were healthy weight, 15 percent were overweight, 11 percent were obese and 3.5 percent were very obese.

Among very obese children ages 3-5, more than 40 percent (42.5 percent) had elevated CRP compared to only approximately 17 percent of healthy weight children. Among older children the difference was even more pronounced. In ages 15-17, 83 percent of the very obese had elevated CRP compared to 18 percent of the healthy weight. The study concludes that weight status and elevated inflammatory markers are strongly related, even in young children, and further research should examine the impact of long-term, low-grade inflammation in overweight and obese children.

"In this study we were unable to tease apart whether the inflammation or the obesity came first, but one theory is that obesity leads to inflammation which then leads to heart and vessel disease later on," said Perrin, senior author of the study.

"A lot more work needs to be done before we figure out the full implication of these findings. But this study tells us that very young, obese children already have more inflammation than children who are

not obese, and that's very concerning. It may help motivate us as physicians and parents to take obesity at younger ages more seriously," Perrin said.

Cam Patterson, M.D., M.B.A., UNC's chief of cardiology and director of the UNC McAllister Heart Institute, said he found it alarming that inflammation associated with obesity is present even in the youngest children. "But that doesn't mean young kids are going to start having heart attacks," he said. "What it does mean is that the inflammatory process that damages blood vessels around the heart may begin much earlier than we have realized.

"There is a ray of hope here, though," said Patterson, who was not involved in the study. "This study suggests that we may be able to reduce the long-term adverse consequences of inflammation on the heart if we can introduce measures that reduce the frequency of childhood health problems such as obesity and other triggers of inflammation."

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