Low-fiber diet puts adolescents at higher risk of cardiovascular disease

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Adolescents who don't eat enough fiber tend to have bigger bellies and higher levels of inflammatory factors in their blood, both major risk factors for cardiovascular disease and diabetes, researchers report.

The study of 559 adolescents age 14-18 from Augusta, Ga., showed they consumed on average about one-third of the daily recommended amount of fiber, said Dr. Norman Pollock, bone biologist at the Medical College

of Georgia and the Institute of Public and Preventive Health at Georgia Health Sciences University.

"The simple message is adolescents need to eat more fruits, vegetables and whole grains," Pollock said. "We need to push recommendations to increase fiber intake." He and Dr. Samip Parikh, an internal medicine resident at GHS Health System, are co-first authors of the study in the *Journal of Clinical* Endocrinology and Metabolism. Only about 1 percent of the young participants consumed the recommended daily intake of 28 grams for females and 38 grams for males. The study appears the first to correlate dietary fiber intake with inflammatory markers in adolescents.

Better understanding the relationships and risks of diet, inactivity and obesity in children and adolescents is particularly critical at a time when about 1 in 3 is overweight or obese, Parikh said. That's nearly triple the rate since 1963, according to the American Heart Association.

Low-fiber consumers in the study were more likely to have more of the visceral fat found in and around major organs in their abdominal cavity. They also tended to have higher levels of inflammatory factors, such as immune cells called cytokines, as well as lower levels of protective adiponection, a protein secreted by fat that helps the body use glucose and fight inflammation. Interestingly, adiponectin levels tend to drop when fat becomes excessive and obesity is generally considered a chronic inflammatory state.

Exactly how fiber helps stave off some of these unhealthy consequences is not completely clear, Parikh said. Hypotheses include increased bulk in the stool causing digested food to spend less time in the gastrointestinal tract and the ability of fiber to improve insulin sensitivity, potentially reducing visceral adiposity. More indirectly, fiber tends to speed satiety, potentially decreasing total food and caloric consumption, Parikh said. It may also help absorb and eliminate

inflammatory factors.

While belly fat and high inflammatory factors are inexorably linked to bad consequences such as heart disease and often occur together, one did not directly cause the other in this instance, Pollock noted. He was co-first author earlier this year of a study on the same group of adolescents that showed high-fructose consumption correlated with higher blood pressure, fasting glucose, insulin resistance and inflammatory factors as well as lower levels of cardiovascular protectors such as such as HDL cholesterol and adiponectin. These dangerous associations were exacerbated by belly fat. "There is some other mechanism (for increased inflammatory factors associated with low-fiber intake)," Pollock noted.

The scientists acknowledge getting adolescents to eat more fiber can be tough, not only because of their penchant for processed foods but because side effects can include intestinal gas, bloating and diarrhea. They are pursuing funding to develop more palatable forms of fiber that could be sprinkled, for example, on the low-fiber foods most adolescents regularly consume.

Study participants were part of a larger study assessing the relationship between activity and diet. The scientists noted that low-fiber intake also was linked to higher levels of overall body fat but only in females. A high-fiber diet seemed to reduce general body fat in males.

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