

High-normal Blood Glucose is Independent Risk for Type 2 Diabetes

Fasting plasma glucose levels that are high but still within the normoglycemia range may help identify apparently healthy men at increased risk for developing diabetes.

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Fasting blood glucose levels in the high range of normoglycemia are an independent risk factor for type 2 diabetes among young men. According to Amir Tirosh, MD, PhD, and colleagues, apparently healthy young men with so-called normal test values were at increased risk, especially if they were heavier and had high triglyceride levels as well.

Dr. Tirosh and colleagues reported findings in *The New England Journal of Medicine*, from more than 13,000 young men in the Israeli defense forces.¹ "Higher fasting plasma glucose levels within the normoglycemic range constitute an independent risk factor for type 2 diabetes among young men, and such levels may help, along with body mass index [BMI] and triglyceride levels, to identify apparently healthy men at increased risk for diabetes," wrote Dr. Tirosh, MD, PhD, from the Israeli Defense Forces Medical Corps. Dr. Tirosh is in the department of internal medicine, A, Sheba Medical Center, Tel-Hashomer.

The American Diabetes Association defines normal fasting plasma glucose as <100 mg/dL.

The investigators obtained medical and lifestyle information from 13,163 apparently healthy men with normal fasting plasma glucose levels who were aged 26 to 45 years. The men were young Israeli adults from the Metabolic, Lifestyle and Nutrition Assessment in Young Adults study, a survey that tracks Israeli service personnel.

During the total of 74,309 person-years of follow-up from 1992 to 2004, 208 incident cases of type 2 diabetes were identified. With every quintile increase in the range of normal fasting plasma glucose >86 mg/dL, the age-adjusted hazard ratio for type 2 diabetes increased. Men in the highest quintile (glucose levels 95 to 99 mg/dL) had a threefold higher risk versus those in the lowest quintile (glucose levels <81 mg/dL; $P < .0001$).

In an adjusted multivariate model, the risk of type 2 diabetes increased progressively in men with fasting plasma glucose levels of ≥ 87 mg/dL versus <81 mg/dL (P for trend <.001).

Also in multivariate models, men who had triglycerides ≥ 150 mg/dL and fasting plasma glucose levels of 91 to 99 mg/dL had a hazard ratio of 8.23 for diabetes versus men with a combined triglyceride level of <150 mg/dL and fasting glucose levels of <86 mg/dL. The combination of BMI ≥ 30 and a fasting plasma glucose level 91 to 99 mg/dL resulted in a HR of 8.29 versus men who had a BMI <25 and fasting plasma glucose <86 mg/dL.

The investigators said that alone, high-normal fasting plasma glucose might not be a strong enough marker for type 2 diabetes risk. More than half of the men in the study had levels ≥ 90 mg/dL but the incident diabetes rate was just 2.3%. A better screening tool might be an individualized risk assessment that includes fasting plasma glucose, BMI and triglycerides.

"Although the study ... deals only with men, there is no reason to believe that the lessons from the study are sex specific," wrote Ronald A. Arky, MD, of the Harvard Medical School, in an accompanying editorial.² "Fasting plasma glucose levels in the high-normal range in young men and women warrant counseling with regard to weight and lifestyle, as well as an assessment of the lipid profile." ■

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1. Tirosh A, Shai I, Tekes-Manova D, et al. Normal fasting plasma glucose levels and type 2 diabetes in young men. *N Engl J Med*. 2005;353:1454-1462.

2. Arky RA. "Doctor, Is My Sugar Normal?" *N Engl J Med*. 2005;353:1511.