Prevalence of Prediabetes and Abdominal Obesity Among Healthy Weight Adults: 18 Year Trend

Arch G. Mainous III, PhD
Rebecca J. Tanner, MA
Ara Jo, MS
Stephen D. Anton, PhD

University of Florida
Funded in part by NIH/NIA P30AG028740
THE STAGGERING COSTS OF DIABETES IN AMERICA

Nearly 30 million Americans have diabetes.

$1 in $3 Medicare dollars is spent caring for people with diabetes.

Diabetes and prediabetes cost America $322 billion per year.

86 million Americans have prediabetes.

$1 in $5 health care dollars is spent caring for people with diabetes.

Today, 3,835 Americans will be diagnosed with diabetes. Today, diabetes will cause 200 Americans to undergo an amputation, 136 to enter end-stage kidney disease treatment and 1,795 to develop severe retinopathy that can lead to vision loss and blindness.

Learn how to fight this costly disease at diabetes.org/congress
Prediabetes

- Prediabetes is a high risk state for the development of diabetes
- Eighty-six million Americans now have prediabetes
  - 38% of adults without diabetes have prediabetes
  - 90% of adults with prediabetes don’t know it
- Without intervention, 15% to 30% of people with prediabetes will develop type 2 diabetes within 5 years.
- Intervening on prediabetes is effective in delaying or stopping the transition to diabetes
Secular trends indicate an increase in sedentary lifestyle.

Recent data suggest that some people at normal weight (BMI 18.5-25) may have decreased lean muscle mass.

Among healthy weight people, low grip strength is associated with undiagnosed diabetes and prediabetes.
Screening for Prediabetes

- Screening for prediabetes is focused on individuals who are overweight or obese
  - Both USPSTF and ADA recommend screening based on BMI among overweight and obese adults
- Screening that is focused on the overweight and obese may miss individuals who are of healthy weight but have prediabetes.
Examine the nationally representative prevalence of prediabetes and abdominal obesity among healthy weight adults in 1988-1994 and 1999-2012
Methods

  - Nationally representative survey sampling non-institutionalized population of the United States
  - Stratified multistage probability sample design
  - Survey includes physical examination, blood and urine tests, and a detailed interview
Subjects

- Adults age 20 and older who have a body mass index of 18.5-24.99, who have not been diagnosed with diabetes or had an HbA1c level of 6.5% or greater at the time of their NHANES physical examination
- Prediabetes defined as HbA1c level between 5.7%-6.4%
- Normoglycemia defined as HbA1c level between 4.0% and 5.6%
- Individuals with HbA1c level below 4.0% were removed from analysis
Abdominal Obesity

- Unhealthy waist circumference
  - Waist circumference greater than 102 cm for men
  - Waist circumference greater than 88 cm for women
- Unhealthy waist to height ratio (WHR)
  - WHR of .53 or greater for men
  - WHR of .49 or greater in women
Methods

Covariates

- First degree relative with diabetes
- Age
- Race
- Education
- Poverty to income ratio
- Health insurance coverage
Methods

Data Analysis

• Data were weighted and accounted for complex sampling design using SUDAAN 11.0
• Prevalence estimates of prediabetes
• Trend analysis: 1999-2012 data using logistic regression for trends in prediabetes and abdominal obesity
  • Time modeled as a continuous variable
• Prediabetes and Abdominal Obesity: T-tests to calculate mean difference in BMI, waist circumference, and WHR between individuals with and without prediabetes
• Forced logistic regression using 2011-2012 data to assess impact of WC and WHR on prediabetes
Prevalence of Prediabetes for Healthy Weight Adults Age 20+ and 45+

10.2 4.6 4.9 5.6 6.6 13.3 14.9 15.6 2212.5 11 15.2 16.7 28 34.3 33.1


Adults age 20+
Adults age 45+

p<.0001
Prevalence of Unhealthy Waist Circumference for Healthy Weight Adults Age 20+ and 45+

P = .38
Prevalence of Unhealthy Waist to Height Ratio for Healthy Weight Adults age 20+ and 45+

P=.01
# Odds Ratios for Abdominal Obesity on Prediabetes

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted OR (95% CI)</th>
<th>Adjusted OR (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age 20 and older</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhealthy Waist Circumference</td>
<td>2.30 (0.93-5.72)</td>
<td>1.03 (0.41-2.60)</td>
</tr>
<tr>
<td>Unhealthy Waist-to-height Ratio</td>
<td>2.58 (1.63-4.10)</td>
<td>1.01 (0.60-1.68)</td>
</tr>
<tr>
<td><strong>Age 45 and older</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhealthy Waist Circumference</td>
<td>1.27 (0.46-3.54)</td>
<td>.95 (0.40-2.27)</td>
</tr>
<tr>
<td>Unhealthy Waist-to-height Ratio</td>
<td>1.40 (0.90-2.18)</td>
<td>1.00 (0.60-1.66)</td>
</tr>
</tbody>
</table>

*Controls for age, sex, race/ethnicity, education, poverty-to-income ratio, health insurance and presence of a first degree relative with diabetes.
Prediabetes prevalence has increased over time among healthy weight adults.

Abdominal obesity has increased by one measure, waist to height ratio, in the same time frame but abdominal obesity does not seem to be the key to prediabetes.

Sedentary lifestyle has increased during the same time.
Limitations

- Different sampling methodologies between NHANES III and Continuous NHANES
- Unable to explain apparent decrease in prediabetes in data that occurs between 1988-1994 data and 1999-2008 data.
- Unable to assess difference between ethnic groups
- Only use HbA1c to assess prediabetes
Conclusion

- Prediabetes is quite prevalent among individuals with a healthy BMI (33% of individuals 45 and older)
- Many individuals with a healthy BMI who have prediabetes may not be caught under current screening guidelines
- Reconsideration of screening recommendations may be in order