

Factors Associated with a High HbA1c Level Among U.S. Adults

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Background

In the United States, the prevalence of obesity is rising. According to the Center of Disease Control (CDC), more than one-third of all adults in the United States are obese. Obesity and a sedentary lifestyle play a large role in the development of diabetes. Glycosylated hemoglobin (HbA1c) is used to diagnose diabetes ($\geq 6.5\%$) and prediabetes ($5.7\text{--}6.4\%$). Regular physical activity (PA) and exercise have been used to help treat and prevent type 2 diabetes.

Methods

Data from the 2013-2014 National Health and Nutrition Examination Survey (NHANES) were analyzed. The study sample included 5,690 participants. The selection criteria for the eligible sample were as follows: 1) age of 18 years or greater; 2) adults who had valid responses for HbA1c (%), BMI (kg/m^2), age (years), sex (males and females), and race (white and other); 3) adults who had valid responses for moderate and vigorous exercise questions.

Glycosylated hemoglobin was recorded as a continuous variable. Participant's were classified as having a high ($\geq 6.5\%$) or low ($< 6.5\%$) level of HbA1c. The independent variables for the models were levels of moderate or vigorous PA performed by each participant and the participant's BMI. The total amount of PA was calculated as a product of the minutes of moderate or vigorous exercise completed per day multiplied by the number of days of the week the exercise was performed. Body mass index was also measured continuously. The control variables for the study were an individual's age and BMI.

Wilcoxon rank sum tests were used to determine differences in non-parametric data of age and weekly minutes of moderate and vigorous exercise across HbA1c level. A logistic regression model was used to determine factors associated with high or low level of HbA1c. Significance level was set at $p < .05$.

Results

Of the 5,690 participants, there were 601 with an HbA1c over 6.5% and were classified as having a high HbA1c for this analysis. When controlling for age and BMI, those with a higher number of weekly minutes spent in vigorous exercise were less likely to have a diabetic level of HbA1c ($R^2 = .14$, $p = .03$).

Participant Characteristics	High HbA1c M \pm SD	Low HbA1c M \pm SD	<i>p</i>
Age (years)	60 \pm 13.1	46.0 \pm 18.3	$< .001$
BMI (kg/m^2)	32.8 \pm 7.2	28.4 \pm 6.7	$< .001$
Moderate PA	63.8 \pm 166.9	92.7 \pm 211.0	$< .001$
Vigorous PA	19.4 \pm 88.4	64.5 \pm 168.4	$< .001$

Participant Characteristics	High HbA1c N (%)	Low HbA1c N (%)	<i>p</i>
Sex			$< .001$
Male	329 (12.1)	2,380 (87.9)	
Female	272 (9.1)	2,709 (90.9)	
Race			$< .001$
White	220 (9.0)	2,216 (91.0)	
Other	381 (11.7)	2,873 (88.3)	

Conclusions

- HbA1c levels associated with diabetes can be reduced when people perform vigorous levels of physical activity throughout the week.
- Performing vigorous levels of physical activity can result in decreased cardiovascular disease risk, decreased overall-mortality rates, and improvement in long term glycemic control in adults.

