Onset Levels of Students after Type 2 Diabetes Mellitus Glucose Tolerance Test

Biology 494

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Abstract

The average age of individuals with Type 2 Diabetes Mellitus (T2DM) is decreasing due to greater chronic stress and negative dietary practices. Ethnicity is a stronger risk factor for T2DM than dietary patterns when energy intake is adjusted. The purpose of this study was to determine the degree of glucose tolerance in college students from different ethnic groups at BYU – Hawaii. Eighteen volunteers participated in this study. Volunteers included those of Polynesian, East Asian and Caucasian ancestry. Six individuals from each ethnicity, ranging in age between 19-26 years were tested for blood glucose using a One Touch Glucose meter. Three tests were administered, a Normal Glucose Tolerance Test (NGT), an Impaired Glucose Tolerance Test (IGT), and an Impaired Fasting Glucose Test (IFG). Blood was obtained by pricking the side of the second finger of subjects. After measuring the normal glucose concentrations, subjects were given ten ounces (296 milliliters) of a Glucose Beverage containing 75 grams of glucose with artificial flavor and coloring. After an hour the IGT readings were recorded. The following morning, before the consumption of food, IFG data were taken. Values for the Normal Glucose Tolerance Test (NGT) varied among groups. These differences were not statistically significant. While there were numerical differences between Asians, Caucasians and Polynesians in the Impaired Glucose Tolerance Test (IGF) these differences were not significant. The Impaired Fasting Glucose Test (IFG) also showed no significant difference among Asians, Caucasians and Polynesians. None of the individuals who participated in this study showed a propensity to early onset Type II diabetes. While ethnicity has been shown to affect glucose response, it was not possible to make such a conclusion from these data.

Keywords: Type 2 Diabetes Mellitus, Glucose test, ethnicities, Asia, Polynesia, Caucasian,

Introduction

Type 2 Diabetes Mellitus (T2DM) is an important health problem in the United States. The economic cost of obesity-related diseases, such as T2DM, in the United States is more than $20 billion annually (Magoc et al. 2010). According to the American Diabetes Association, Type 2 Diabetes Mellitus occurs when the body does not produce enough insulin or the cells ignore the insulin signal. Insulin plays a major role in regulating glucose metabolism. Insulin resistance (T2DM) is closely associated with obesity, dyslipidemia, and cardiovascular diseases (Frontoni et al. 2003, Wang et al. 2011). The advance of T2DM with age is frequently associated with impaired glucose handling and a decline in glucose tolerance (Paolisso et al. 1999). Obesity has increased by 70% in adults aged 18–29 years, while T2DM has increased by 70% in adults aged 30–39 years, over the last decade (Mokdad et al. 2000, Hessler et al. 2011). Young adults are the fastest growing adult group for both obesity and Type 2 Diabetes (Hillier and Pedula 2003).
T2DM is influenced by obesity, which is a risk factor for high blood pressure, high cholesterol, heart disease and stroke (Succurro et al. 2008, Magoc 2010, and Sniehotta et al. 2011). The average life span of individuals with T2DM is decreasing due to greater chronic stress and negative dietary practices (Hessler et al. 2011).

Brigham Young University Hawaii is attended by students from around the world. Kim et al. (2008) found that ethnicity is a stronger risk factor for T2DM than dietary patterns when energy intake is adjusted. The purpose of this study was to determine the degree of glucose tolerance in college students from different ethnic groups at BYU – Hawaii.

Method

This study was approved by The Human Subject Review Board of the Brigham Young University of Hawaii. Eighteen volunteers participated in this study. Volunteers included those Polynesians (Samoan or Tongan, born and raised in native country with three grandparents who were born and raised in country), East Asians (Taiwanese, Chinese, Japanese, Hongkongese, and Korean with three grandparents who were born and raised in country), and Caucasian ancestry (with European either English, French, German, Italian, Polish, Swedish, Scottish, or Slovakian background). Six individuals from each ethnicity, ranging between ages 19-26 years were tested for blood glucose using a One Touch Glucose meter. Three tests were administered, a Normal Glucose Tolerance Test (NGT), an Impaired Glucose Tolerance Test (IGT), and an Impaired Fasting Glucose Test (IFG).

Blood was obtained by pricking the side of the second finger of subjects, using the sterile lancet provided in the blood glucose kit. After measuring the normal glucose concentrations, subjects were given ten ounces (296 milliliters) of a Glucose Beverage (Azer Mart, Item #: 10-SP-075) containing 75 grams of glucose with artificial flavor and coloring. After an hour the IGT
readings were recorded. The following morning, before the consumption of food, the IFG reading data were taken. Data were analyzed by repeated measures ANOVA.

**Results**

Values for the Normal Glucose Tolerance Test (NGT) varied among groups. Polynesians had the highest normal levels of glucose (97.67mg/ml) while Caucasians had the lowest (78.67mg/ml) (Table 1). These differences were not statistically significant. While there were numerical differences between Asians, Caucasians and Polynesians in the Impaired Glucose Tolerance Test (IGF) these differences were not significant (Table 1). The Impaired Fasting Glucose Test (IFG) also showed no significant difference among Asians, Caucasians and Polynesians (Table 1).

Table 1

Normal Glucose Tolerance Test (NGT), Impaired Glucose Tolerance Test (IGT), and Impaired Fasting Glucose Test (IFG) factor scores by different ethnicities.

<table>
<thead>
<tr>
<th></th>
<th>Asian (n=6)</th>
<th>Polynesian (n=6)</th>
<th>Caucasian (n=6)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGT (mg/ml)</td>
<td>94.17 (21.29)</td>
<td>97.67 (12.01)</td>
<td>78.67 (15.04)</td>
<td>0.142</td>
</tr>
<tr>
<td>Mean/SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGF (mg/ml)</td>
<td>98.67 (9.67)</td>
<td>117.50 (46.82)</td>
<td>117.67 (27.75)</td>
<td>0.511</td>
</tr>
<tr>
<td>Mean/SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IFG (mg/ml)</td>
<td>74.167 (6.27)</td>
<td>78.67 (3.50)</td>
<td>77.50 (7.89)</td>
<td>0.442</td>
</tr>
<tr>
<td>Mean/SD</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Significant elevations in pre-NGT and post-IFG test were observed in the three groups due to the glucose challenge when the data were lumped (Table 2). However when the groups were separated by ethnicity the rise in the Asian group was not significant. The decrease in blood glucose was significant for all groups following the overnight fast.

Table 2
The Pre- NGT and Post-IGF comparison of participant elevated glucose levels.

<table>
<thead>
<tr>
<th></th>
<th>Pre-NGT (mg/ml) Mean/SD</th>
<th>Post- IGF (mg/ml) Mean/SD</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian (n=6)</td>
<td>90.17 (17.73)</td>
<td>111.7 (31.35)</td>
<td>0.01</td>
</tr>
<tr>
<td>Polynesian (n=6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian (n=6)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion

The glucose challenge resulted in significant elevations in blood glucose in Polynesians and Caucasians but not in Asians. This was the result of a blunted response in the Asian group. These results may be due to a small sample size or may indicate a metabolic difference among individuals. Without further testing, it is not possible to determine. The comparisons across groups suggest no significant differences in the group’s initial glucose status or in the fasting response. While Caucasians had a lower initial value the differences were not significant suggesting that all three groups shared similar metabolic profiles. None of the individuals who
participated in this study showed a propensity to early onset Type II diabetes. While ethnicity has been shown to affect glucose response, it was not possible to make such a conclusion from these data.

Further studies would benefit from a larger sample size and more sampling times during the glucose challenge. An increase in the glucose concentration of the supplemented beverage might also elicit a greater range of responses.
Sources Cited


