SJSM Science

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Issue No 2.
Summer 2012

Effects of sleep restriction on glucose tolerance and blood pressure in young adults

The stress of sleep loss under the demands of student life conditions, including exam sessions or social student activities is not possible to replicate in laboratory conditions, but would be worthy to study in order to estimate the impact of acute and chronic sleep deprivation on the health of medical students.

A group of SJSM students also wanted to determine whether sleep deprivation has effects on glucose tolerance and regulation of blood pressure in young adult healthy subjects.

Dalal Mazraeh; Harpreet Singh; Mark Shaboo
Effects of sleep restriction on glucose tolerance and blood pressure in young adults

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SAINT JAMES SCHOOL OF MEDICINE, ANGUILLA
2012

Introduction

Sleep deprivation is considered as an important stress indicator. Particularly, sleep deprivation has profound effects on several biologic processes, including memory consolidation, immunologic response, and neuroendocrine function (2). There is a substantial body of empirical evidence indicating that sleep can influence glucose metabolism (5). Several cross-sectional and longitudinal studies have also demonstrated a link between short sleep duration, poor sleep quality and increased risk of obesity, diabetes (2), hypertension (5), cardiovascular disease and metabolic syndrome (7). By the present time there were only limited number studies measuring effect of sleep restriction on glucose metabolism in healthy young adult female population (5). The stress of sleep loss under the demands of student's conditions, including exam sessions or social events activities is not possible to replicate in laboratory conditions but would worth to study in order to estimate impact of acute and chronic sleep deprivation on health of medical students.

Aim of the study

To determine whether sleep deprivation has effects on glucose tolerance and regulation of blood pressure in young adult healthy subjects.

Materials and Methods

Subjects: Volunteers were recruited from the Anguilla campus to take part in this study (n=10). Volunteers were between the ages of 21-39 with BMI of less than 30, and consume less than two alcoholic or other caffeine containing beverages per day. Habitually sleep at least 7 hours, and wake up at their usual bedtime before 1 AM. Additional inclusion criteria included absence of cigarette smoking, and absence of any current medication or non-prescription NSAIDs in the last 3 months. Volunteers were then conducted the following timelines of the study and reporting to the co-investigators at the end of each timeline

Monitoring of sleep duration: We asked the participants to complete a sleep diary and use iPhone/iPod application “mSleepCyc” which allows monitoring of total sleep duration based on body movements pattern during bedtime.

Oral Glucose Tolerance Test: Every individual was then given an oral glucose tolerance test (OGTT), which was used to categorize the participants into normal, prediabetic or diabetic classifications. Testing was performed using glucose measuring meters and testing strips. The blood glucose levels of subjects were measured after fasting 12hrs. Immediately following the fasting glucose measure, the participants were asked to drink 75g of glucose solution (15g/sucrose water). Two additional measurements were done at 1-hour and 2-hours after glucose challenge. Hematopoietic and diastolic blood pressures were taken by the manual sphygmomanometer before initiation of blood collection.

Results

Table 1: Changes in fasting Blood Glucose Levels before and after Sleep Restriction

<table>
<thead>
<tr>
<th>Fasting Glucose, mEq/L</th>
<th>BL</th>
<th>SR</th>
<th>REC</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>Participant1</td>
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<td>110</td>
<td>112</td>
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<tr>
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<td>105</td>
<td>110</td>
<td>0.05</td>
</tr>
<tr>
<td>Participant3</td>
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<td>107</td>
<td>109</td>
<td>0.03</td>
</tr>
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<td>Participant4</td>
<td>110</td>
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<tr>
<td>Participant5</td>
<td>112</td>
<td>114</td>
<td>115</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Table 2: Changes in Fasting Blood Glucose Levels before and after Sleep Restriction

<table>
<thead>
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<th>Glucose Tolerance Test</th>
<th>mEq/L</th>
<th>BL</th>
<th>SR</th>
<th>REC</th>
<th>P-value</th>
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<tr>
<td>Participant5</td>
<td>112</td>
<td>114</td>
<td>116</td>
<td>0.001</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Changes in 2 h OGTT blood glucose level after sleep restriction (BL) post glucose recovery (REC). Delta are expressed as percentages of participants individual baseline values.

Statistical Analysis:

Statistical Analysis. For all measured parameters mean values SEM were calculated for each point of BL, SR, and REC periods. In addition, SR and REC values were expressed as percentages of each individual participant’s BL value, that is, normalized. We have compared SR and REC values to BL values by applying paired tests for normally distributed differences and Wilcoxon signed rank tests for differences that were not normally distributed. The normality of differences was checked using Kolmogorov-Smirnov goodness of fit test. A P-value of 0.05 was considered to be statistically significant. All statistical analyses were carried out using STATGRAPHICS PLUS 2.1.

REFERENCES