Insulin Resistance in Young Adults with Impaired Sleep

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44th Biennial Convention
Sigma Theta Tau International
Disclosure

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Learner Objectives

• Review the prevalence of insulin resistance in young adults
• Describe risk factors for T2DM
• Discuss the impact of impaired sleep in young adults at risk for T2DM

Grant Funding: Byrdine F. Lewis School of Nursing and Health Professions Internal Grant Award

1. Byrdine F. Lewis College of Nursing and Health Professions, Georgia State University
2. Department of Health and Community Systems, School of Nursing, University of Pittsburgh
3. Program in Nutrition, Department of Health Sciences, Boston University/College of Health and Rehabilitation Sciences: Sargent College
4. School of Public Health, Georgia State University
Background

- **Increasing Incidence of T2DM in young adults**
  
  (CDC, Rate of diagnosed diabetes, 2014)

- **Impaired sleep associated with development of insulin resistance and T2DM.**

- **50-70 million persons in the US have impaired sleep**
  
  (CDC, Insufficient Sleep, 2014)
• Impaired sleep becoming more common in young adults
• Risk for developing diabetes in persons with difficulty in maintaining sleep is 1.87

(Reutrakul & Van Cauter, 2014)
Purpose

- To determine the presence of insulin resistance and other risks for T2DM in young adults (ages 18-25 years) with impaired sleep.
Sample and Eligibility (N=32)

• **Inclusion Criteria**
  
  • Age 18-25 years of age
  
  • Self-report of short sleep (less than 6hrs/night) OR
  
  • Self-reported poor quality sleep: Score of > 5 on the Pittsburg Sleep Quality Index (PSQI)
Exclusion Criteria

- Pregnancy or history of gestational diabetes
- Diagnosed sleep disorder
- Diagnosis of diabetes
- Night shift worker
Measures

• Insulin resistance: HOMA2-IR (Esteghamati et al., 2010)

• Impaired Sleep
  • Sleep quality (PSQI) (Buysse, et al., 1989)
  • Actigraphy monitoring for one week (objective sleep measures) (Marino et al., 2013)
    • Total Sleep Time (Sleep duration)
    • Sleep Onset Latency (Number of minutes taken to fall asleep)
Measures Continued

- T2DM risk factors (based on ADA risk assessment tool)
- Height and weight for calculation of BMI kg/m²
- Self-Rated Health
### Sample Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total (N=32)</th>
<th>Male (n=10)</th>
<th>Female (n=22)</th>
<th>p-value&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td>20.5 (±1.87)</td>
<td>21.1 (±2.2)</td>
<td>20.3 (±1.7)</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American/Black</td>
<td>15(46.9)</td>
<td>3(30)</td>
<td>12(54.5)</td>
<td>0.12</td>
</tr>
<tr>
<td>Asian</td>
<td>5(15.6)</td>
<td>3(30)</td>
<td>2(9.1)</td>
<td></td>
</tr>
<tr>
<td>Caucasian/White</td>
<td>8(25)</td>
<td>4(40)</td>
<td>4(18.2)</td>
<td></td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>4(12.5)</td>
<td>0(0)</td>
<td>4(18.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>29(90.6)</td>
<td>9(90)</td>
<td>20(90.9)</td>
<td>0.94</td>
</tr>
<tr>
<td>Married</td>
<td>3(9.4)</td>
<td>1(10)</td>
<td>2(9.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Work Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>1(0.03)</td>
<td>1(10)</td>
<td>0(0)</td>
<td>0.32</td>
</tr>
<tr>
<td>Part-time</td>
<td>20(0.63)</td>
<td>6(60)</td>
<td>14(63.6)</td>
<td></td>
</tr>
<tr>
<td>Not employed</td>
<td>11(0.34)</td>
<td>3(30)</td>
<td>8(36.4)</td>
<td></td>
</tr>
<tr>
<td><strong>Hours worked per week</strong></td>
<td>18.75 (±8.5)</td>
<td>19.5 (±12.1)</td>
<td>18.3 (±6.3)</td>
<td>0.77</td>
</tr>
<tr>
<td>Characteristics</td>
<td>Total (N=32)</td>
<td>Male (n=10)</td>
<td>Female (n=22)</td>
<td>p-value$^d$</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
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</tr>
<tr>
<td>Self-rated Health$^a$</td>
<td>2.16 (±0.77)</td>
<td>2 (±0.67)</td>
<td>2.23 (±0.81)</td>
<td>0.44</td>
</tr>
<tr>
<td>Number of ADA T2DM Risk Factors$^b$</td>
<td>1.28 (±1.02)</td>
<td>2.2</td>
<td>0.86</td>
<td>0.001</td>
</tr>
<tr>
<td>BMI (kg/m$^2$)</td>
<td>23.9 (±5.6)</td>
<td>27.7 (±6.36)</td>
<td>24.1 (±4.17)</td>
<td>0.07</td>
</tr>
<tr>
<td>Average Sleep Duration (hours)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>6.49 (±6.7)</td>
<td>6.28 (±0.81)</td>
<td>6.5 (±0.89)</td>
<td>0.36</td>
</tr>
<tr>
<td>Weekend</td>
<td>6.7 (±10.9)</td>
<td>6.33 (±1.07)</td>
<td>7.06 (±1.43)</td>
<td>0.18</td>
</tr>
<tr>
<td>Sleep Quality Score on PSQI$^c$</td>
<td>8.91 (±2.13)</td>
<td>8.8 (±2.39)</td>
<td>8.95 (±2.06)</td>
<td>0.85</td>
</tr>
<tr>
<td>Fasting Glucose (mg/dL)</td>
<td>95 (±6.28)</td>
<td>100.08 (±5.29)</td>
<td>92.73 (±5.34)</td>
<td>0.001</td>
</tr>
<tr>
<td>Fasting Insulin (microU/mL)</td>
<td>10.68 (±6.95)</td>
<td>11.78 (±10.82)</td>
<td>10.18 (±4.51)</td>
<td>0.56</td>
</tr>
<tr>
<td>Insulin Resistance: HOMA2-IR</td>
<td>1.39 (±0.89)</td>
<td>1.53 (±1.37)</td>
<td>1.32 (±0.58)</td>
<td>0.53</td>
</tr>
</tbody>
</table>

$^a$ On a scale of 1-5 with 1=Excellent and 5=Poor  
$^b$ Based on ADA T2DM Risk Factor Scale  
$^c$ Score >5 on Pittsburgh Sleep Quality Index (PSQI) indicates overall poor quality sleep; Higher scores indicate worse quality  
$^d$ Comparisons with Chi-Square tests or independent samples t-tests
Results

- Insulin resistance defined HOMA2 IR > 1.775 (Esteghamati et al., 2010)
- 18.8% ($n=6$) of the sample had evidence of insulin resistance
- 83% ($n=5$) of those with insulin resistance had BMI ≥ 25
- 50% ($n=3$) of those with insulin resistance had BMI ≥ 30
- Males (110.08 ± 5.29) had higher blood glucose concentrations than females (92.73 ± 5.34) ($t = 3.617$, $p = 0.001$).
• Males (2.2) had higher number of risk factors for T2DM than females (0.86) ($t = 4.271$, $p = 0.001$)

• BMI significantly associated with
  • Blood glucose level ($r = .35$, $p = 0.04$)
  • Insulin level ($r = .55$, $p = .001$)
  • HOMA2 IR ($r = .55$, $p = .001$)
  • Number of T2DM risk factors associated with PSQI ($F = 5.3$, $p = .011$)
  • No associations with sleep duration with other study variables.
Discussion

• Participants averaged a short sleep duration (National Sleep Foundation recommends 7-9 hours per night for this age group).

• Impaired sleep is an important risk factor to consider in this age group.
Discussion

• Almost 50% of sample were at minimum overweight (BMI ≥ 25).
• Modifiable risk factors of T2DM were identified.
• Nearly 20% of participants had indications of insulin resistance.
• BMI was also a significant risk factor.
Conclusions

- Young adults with impaired sleep may be a potential target population for reducing insulin resistance.
- Preliminary findings highlight the need for increased education and preventative efforts to reduce risk for developing T2DM in this population.
Conclusions

• This preliminary study adds to our understanding of risk factors for insulin resistance, sleep quality and T2DM.

• A more comprehensive and adequately powered study is necessary for identifying possibilities for intervention.
KEEP CALM AND SLEEP ON
References


References


