Fasting Insulin as an Early Predictor for Type 2 Diabetes: CARDIA Cohort Analysis

Mark Sahyouni, MS3; Godwin Dogbey, PhD; Nicholas Pennings, DO.
Campbell University School of Osteopathic Medicine, Buies Creek, NC

Introduction

• As of 2022, 96 million Americans have pre-diabetes.
• Current ADA screening standards include fasting glucose, oral glucose tolerance test, or HbA1c.
• Studies found that hyperinsulinemia spikes preceded glucose elevation by 3 years prior to type 2 diabetes (T2D) diagnosis.
• Studies suggest fasting insulin is a potential marker for T2D risk, especially those with glycaemia on the upper limit of normal or in the low pre-diabetic range.

Methods/Results

Objective

• While using ADA screening criteria, assess predictive value of fasting insulin with fasting glucose in T2D conversion risk after 5 years.

Methods

• Using SPSS, fasting glucose and fasting insulin quartile data was analyzed on year 25 and 30 from the Coronary Artery Risk Development in Young Adults (CARDIA) cohort database.

Discussion

• There was a 10% 5-year T2D risk for early pre-diabetics when using fasting glucose alone vs. 16% 5-year T2D risk for Q4 when using fasting insulin alone.
• Along with a 17% 5-year T2D risk for early pre-diabetics + Q4 fasting insulin group.
• For patients in early prediabetes group that developed T2D after year 5, 71% of them were in Q4 and 86% from Q3+Q4.
• This study is limited by sample size and inability to exclude participants pregnant in the study.

Conclusion

• Early prediabetic patients who converted to T2D were more likely to have elevated insulin levels 5 years prior to diagnosis.
• Using fasting insulin increased 5-year risk predictability for early pre-diabetes (10% vs. 17%).
• It is conceivable utilizing fasting serum insulin can enhance screening of pre-diabetic to T2D conversion rather than using glucose alone.
• Suggestions for future studies on using fasting serum insulin to assess patient risk of conversion from pre-diabetes to T2D versus using glucose alone.

References


Table 1: Fasting insulin values by quartile.

<table>
<thead>
<tr>
<th>Insulin Quartiles (mIU/L)</th>
<th>Q1 &lt; 5.4</th>
<th>Q3 8.7-14.2 (hyperinsulinemia)</th>
<th>Q2 5.4-8.6</th>
<th>Q4 = 14.2 (hyperinsulinemia)</th>
</tr>
</thead>
</table>

Table 2: Statistical analysis of T2D converters in early pre-diabetics by fasting insulin quartiles.

<table>
<thead>
<tr>
<th>Insulin Quartiles</th>
<th>Early Pre-diabetes</th>
<th>Proportion</th>
<th>Proportion</th>
<th>P-value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4 vs Q3</td>
<td>0.059</td>
<td>0.158</td>
<td>0.034</td>
<td>0.056</td>
<td>0.019</td>
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<tr>
<td>Q4 vs Q2</td>
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</tr>
</tbody>
</table>

Figure 2: Distribution of converters to T2D after 5 years by fasting blood glucose levels.

Figure 3: Distribution of converters from early prediabetes to T2D after 5 years by fasting insulin quartiles.

Figure 4: 5-year risk of developing T2D in early pre-diabetic group by insulin quartile. From 234 individuals in Q4, 17% of them had T2D after 5 years.

Figure 5: Distribution of converters from early prediabetes to T2D after 5 years by fasting insulin quartile. 51 total pre-diabetics developed T2D after 5 years, 71% of which was in Q4.