

Effect on glucose metabolism by three different diets in patients with diet-treated diabetes type 2

- **Aim: to assess differences in glucose metabolism and laboratory parameters in patients with diabetes type 2 eating four diets differing regarding content of whole grain and glycemic index.**



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- **The aim was to include 80 patients with diabetes type 2 according to standard WHO criteriae, treated with life-style intervention, no pharmacological treatment. Age 25-75, no drugs affecting insulin sensitivity i e cortison, other standard exclusion criteriae.**
- **Parallell design, four arms**



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- **Intervention: Study period 4 weeks**
 - 1: Bread A. High GI, low whole grain white wheat bread**
 - 2: Bread B. High GI, high whole grain fine wheat bread,**
 - 3: Bread C. Low GI, high whole grain wheat kernel bread. Kernel content 90%**
 - 4: Bread D. Low GI, high whole grain barley bread. Kernel content 90%.**



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- **According to swedish nutritional recommendations carbohydrates should cover 55-60% of the daily energy needs**
- **study breads give 60% of the daily carbohydrate intake.**
- **Individual weekly diet lists were made according to sex, medical history and weight**



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- **Primary endpoint: Insulin first-phase response and insulin sensitivity**
- **Secondary endpoints: HbA1c, fasting plasma glucose, HDL, LDL, TG, ApoA, ApoB, PAI-1 and high sens CRP**
- **All measurements beginning and end of study period.**

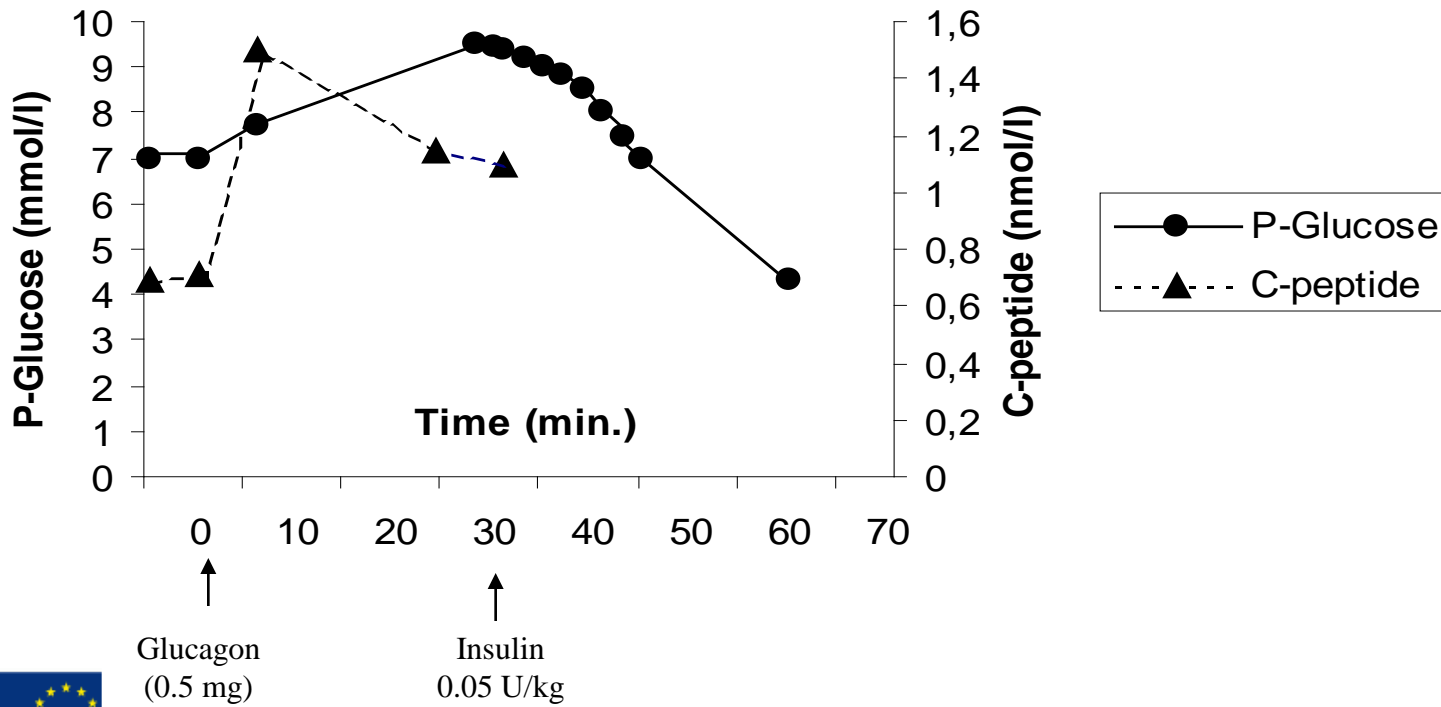




GITT=Glucagon-Insulin Tolerance Test

Glucagon C-peptide test and the Insulin Tolerance Test

C-pept. response = 6 min. - start
 $K_{ITT} = \text{Ln } 2 / T_{1/2} \times 100$
 $DI = \Delta \text{ C-pept.} \times K_{ITT}$





Independent measures of insulin secretion and insulin sensitivity during the same test: the glucagon–insulin tolerance test

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Final state of the intervention study

- **71 patients have entered the study**
- **58 patients have completed the intervention**
- **Bread A:13, B:16, C:12, D:16**
- **Dropouts A:5, B:1, C:3, D:5**
- **M:F ratio A:5/8, B: 7/9, C: 5/7 D:8/8**
- **Mean BMI (kg/m²) A:28.2, B:27.8, C 25.9, D 28.6**
- **Median weight (kg) A:76, B:83, C:75, D:84**

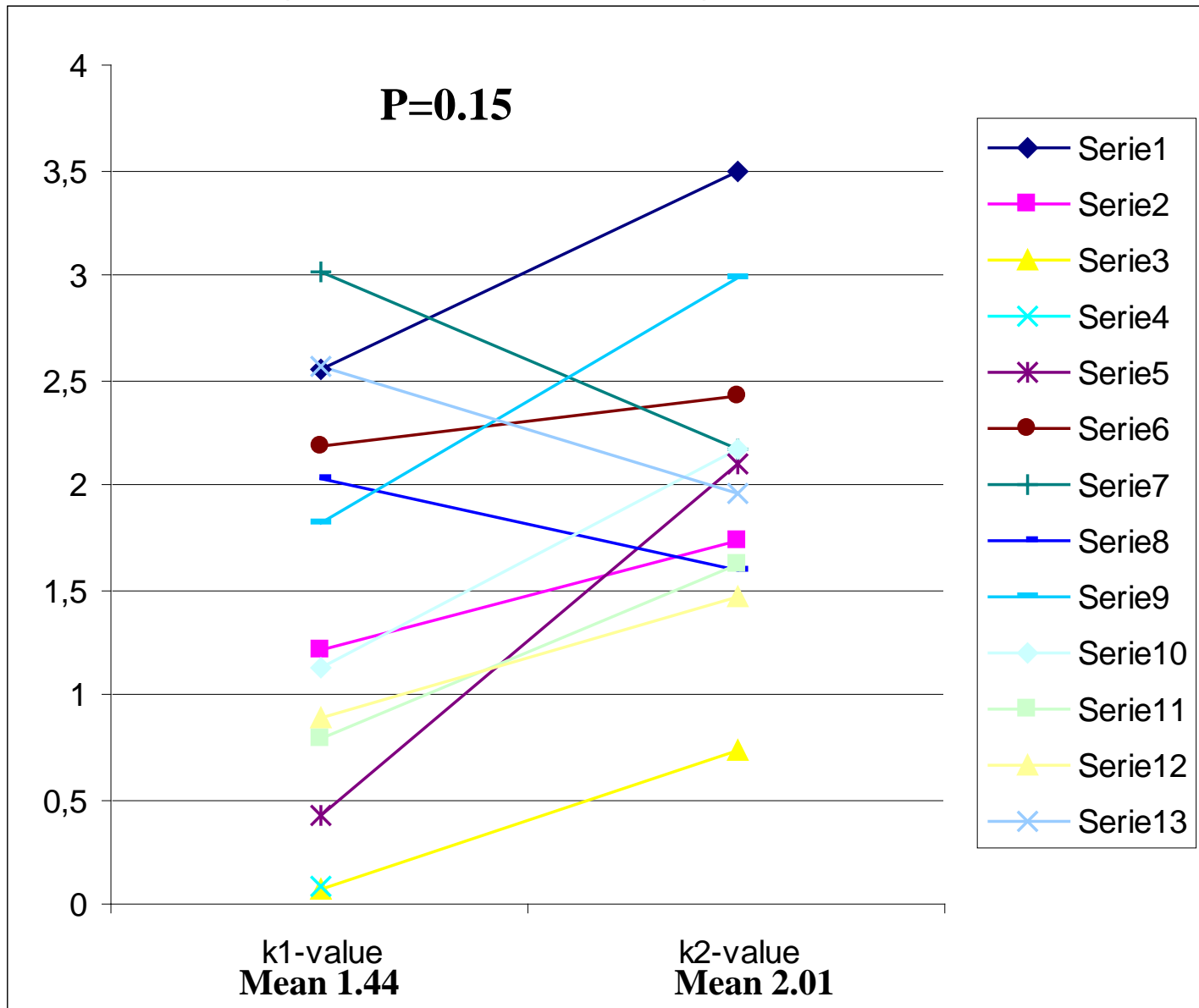


Results

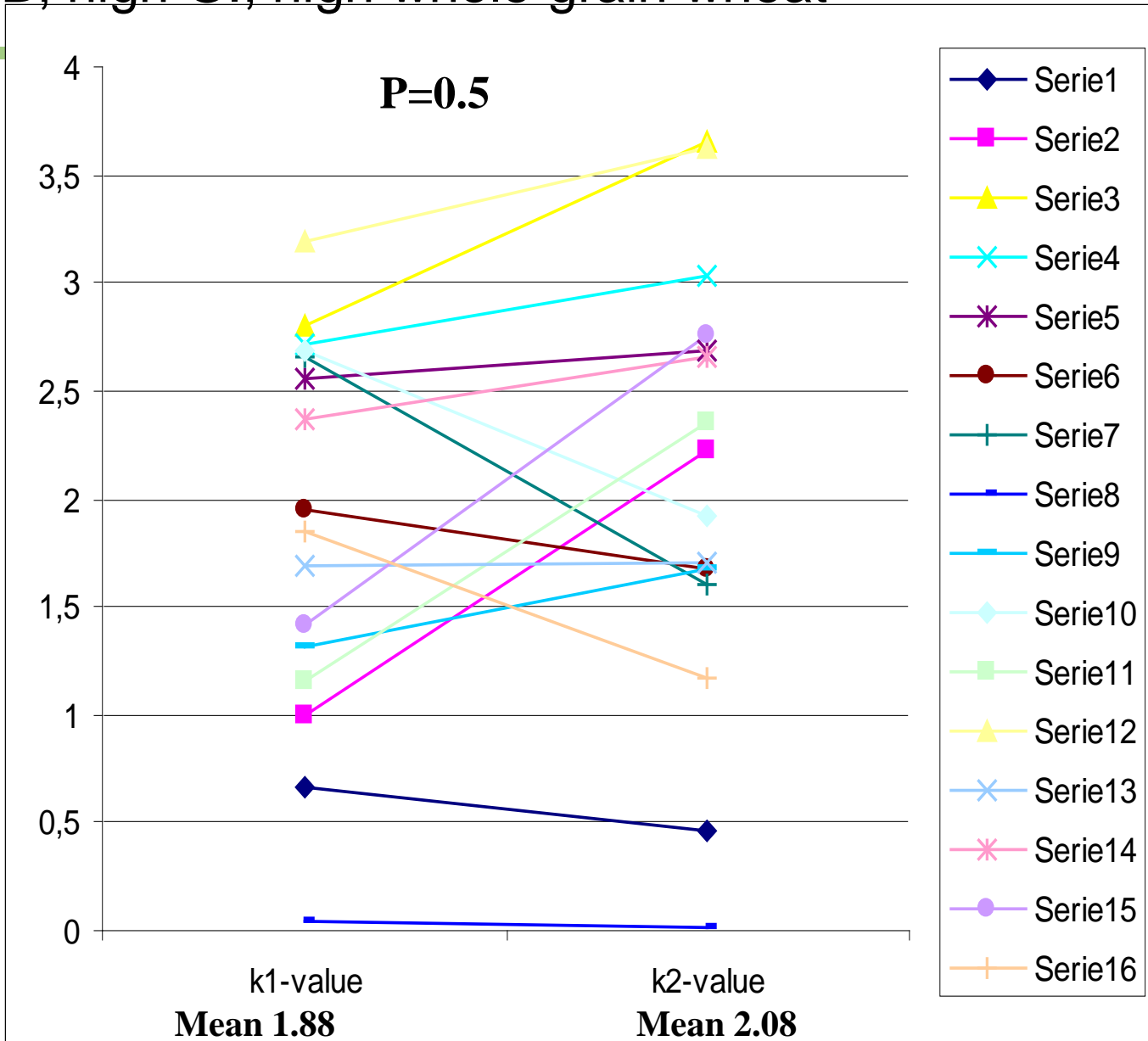
- **No change regarding BP, lipids, CRP and PAI (preliminary),**
- **Mean weight change (kg)**
A:+0.8, B:+0.1, C:+0.3, D:+2.1



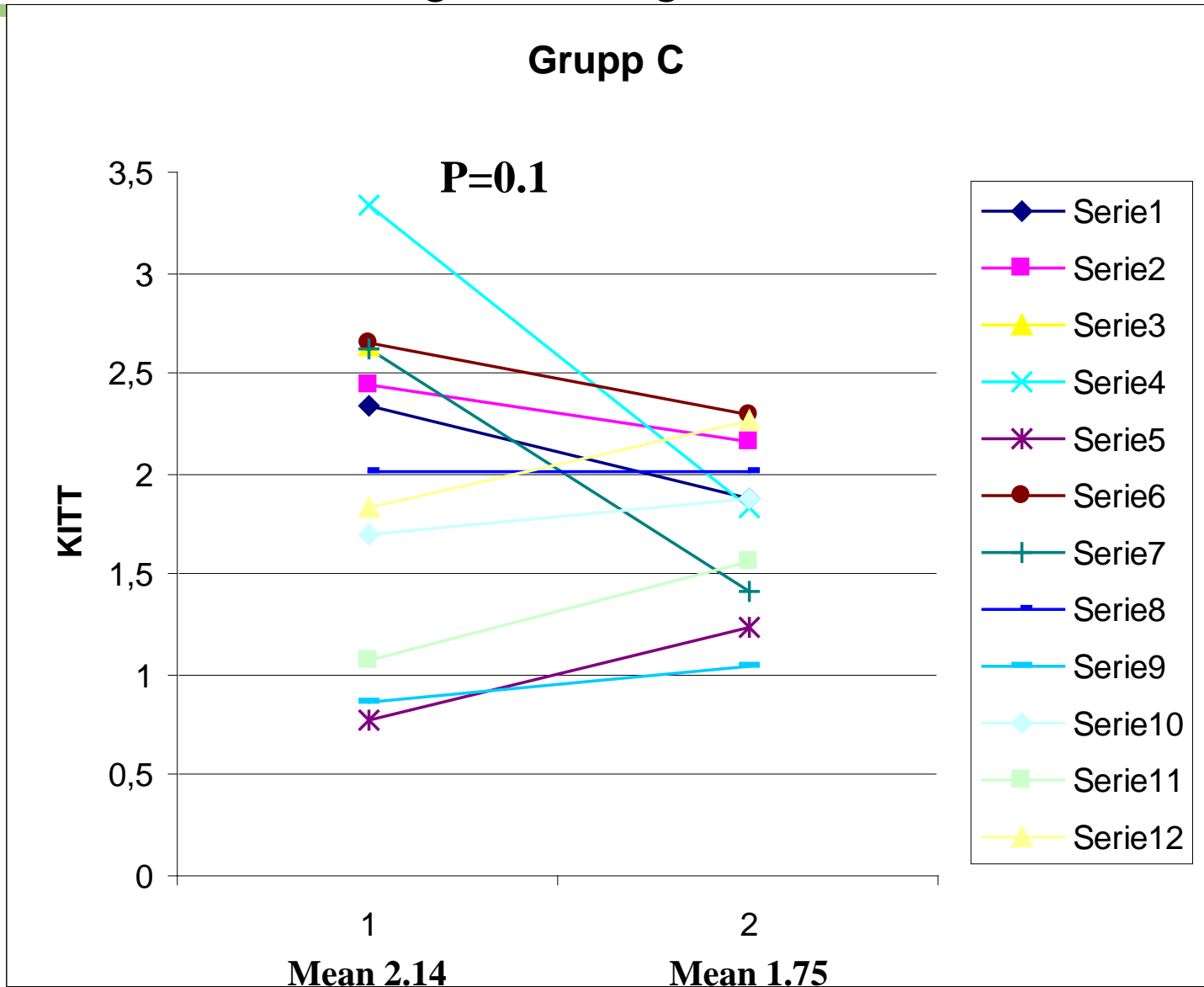
Bread A, high GI, low whole grain wheat



Bread B, high GI, high whole grain wheat



Bread C, low GI, high whole grain wheat kernel





Bread D, low GI, high whole grain barley kernel

P=0.001



Mean 1.90

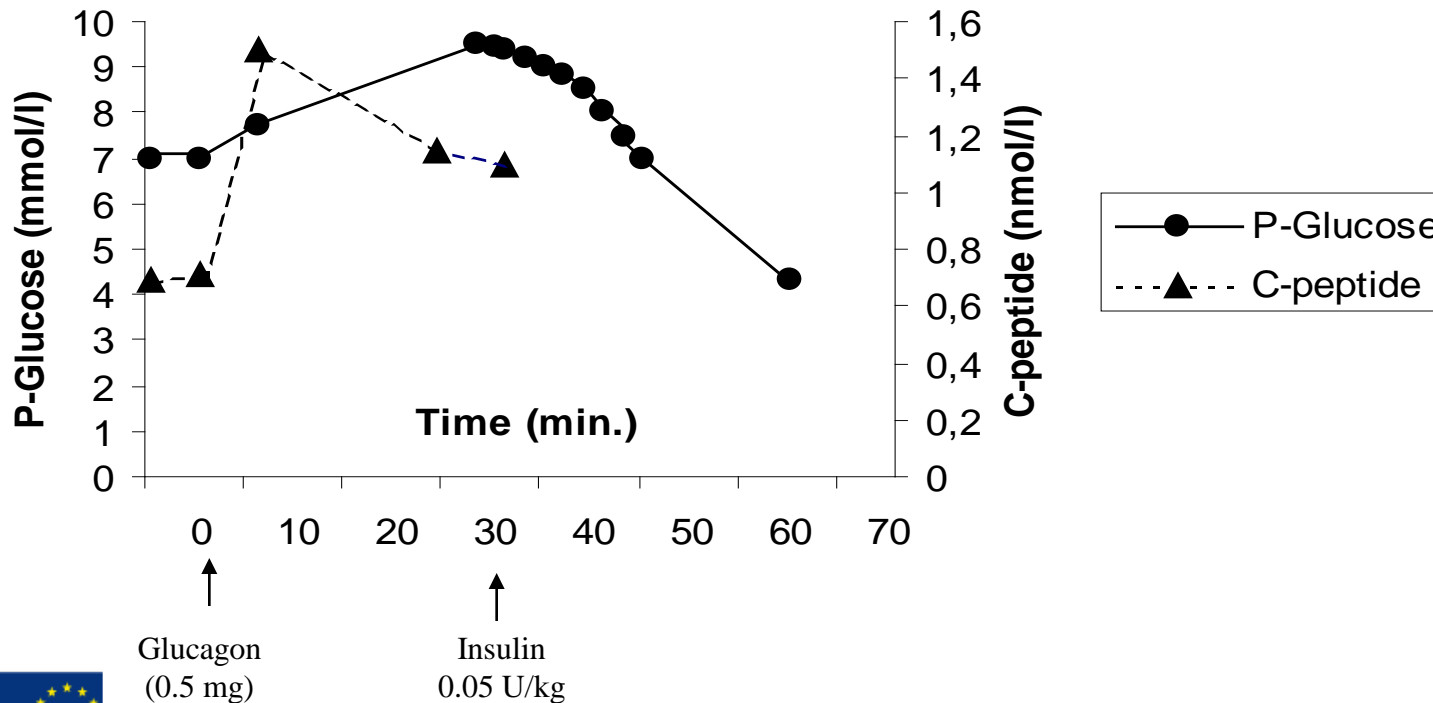
Mean 2.65



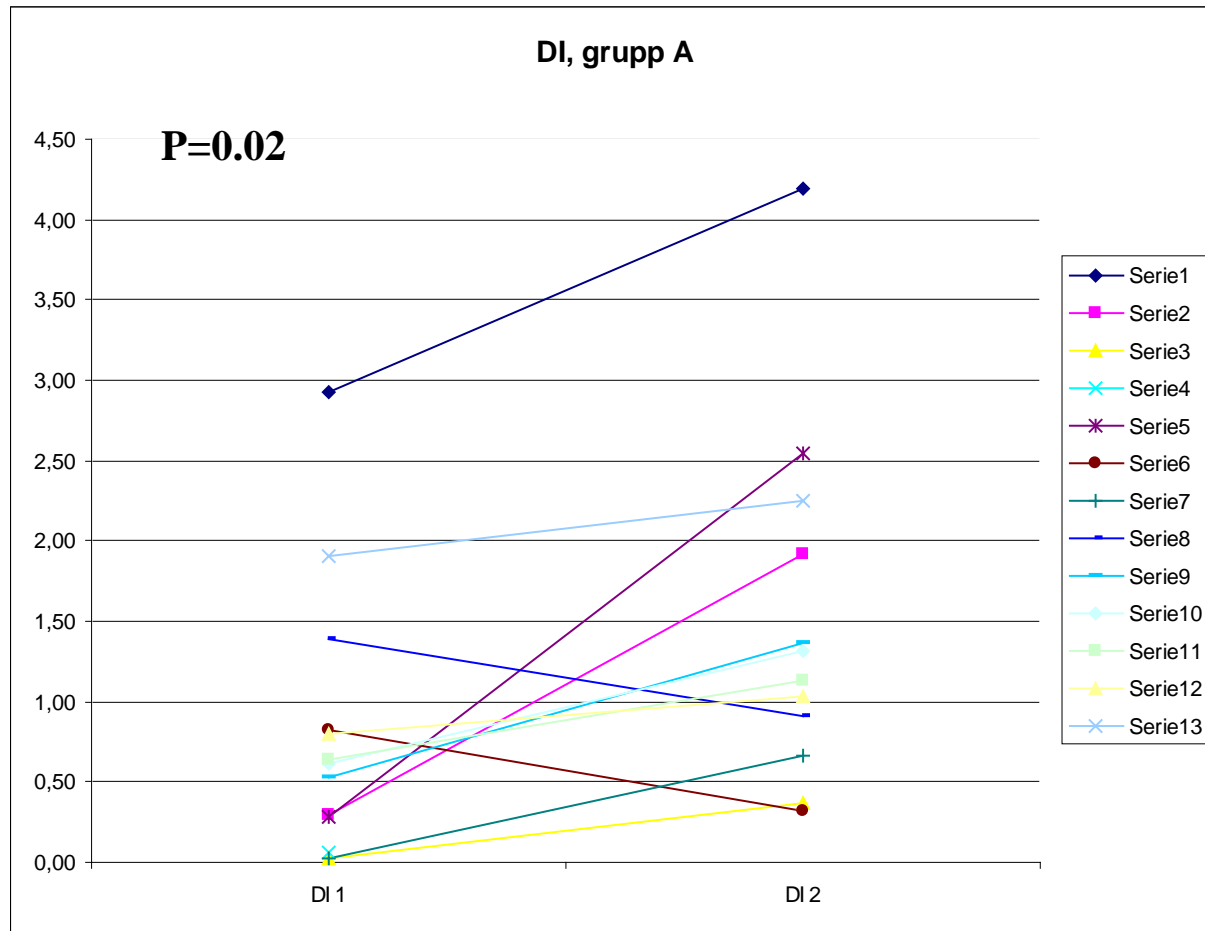
GITT=Glucagon-Insulin Tolerance Test

Glucagon C-peptide test and the Insulin Tolerance Test

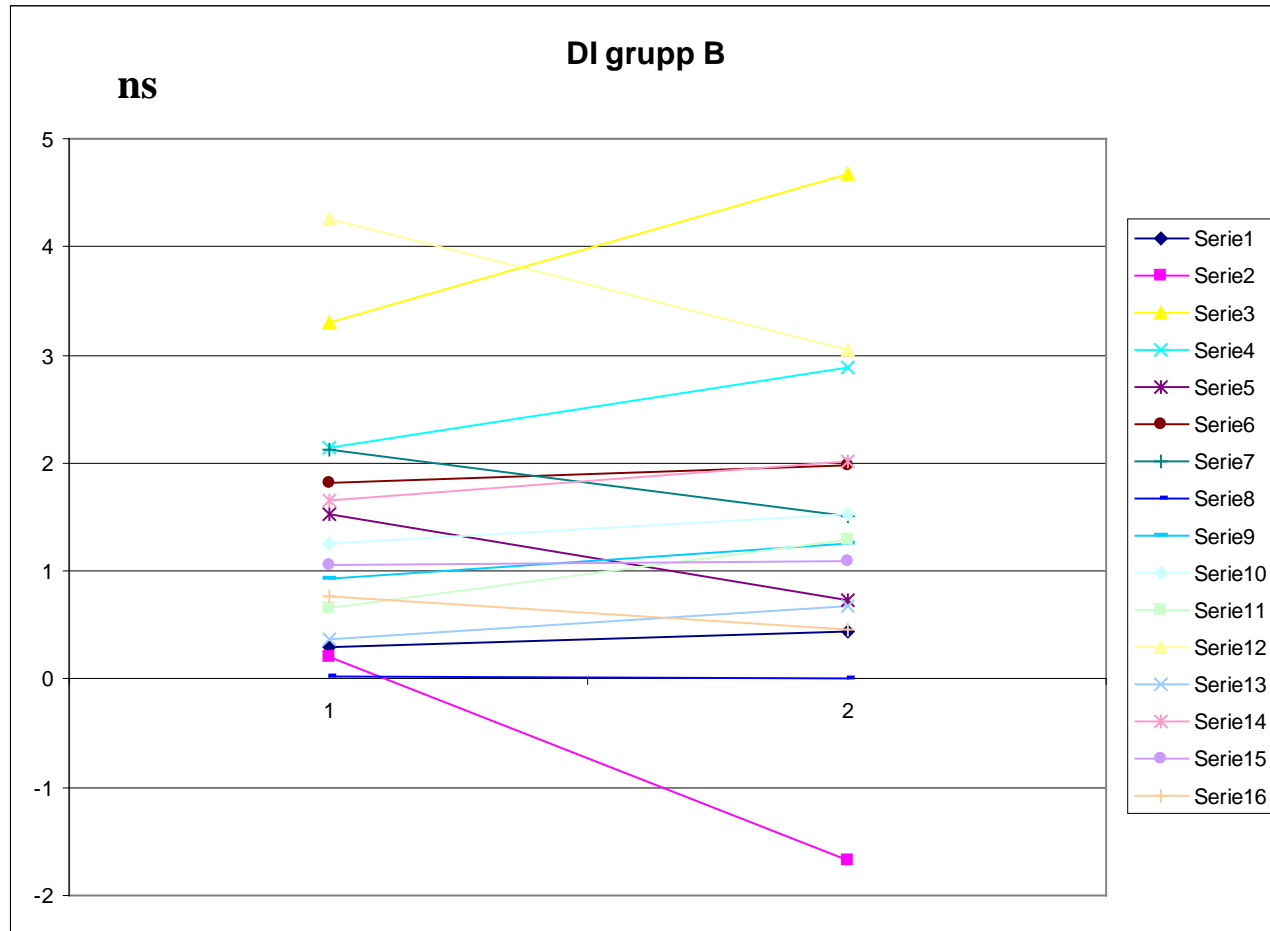
C-pept. response = 6 min. - start
 $K_{ITT} = \text{Ln } 2 / T_{1/2} \times 100$
 $DI = \Delta \text{C-pept.} \times K_{ITT}$



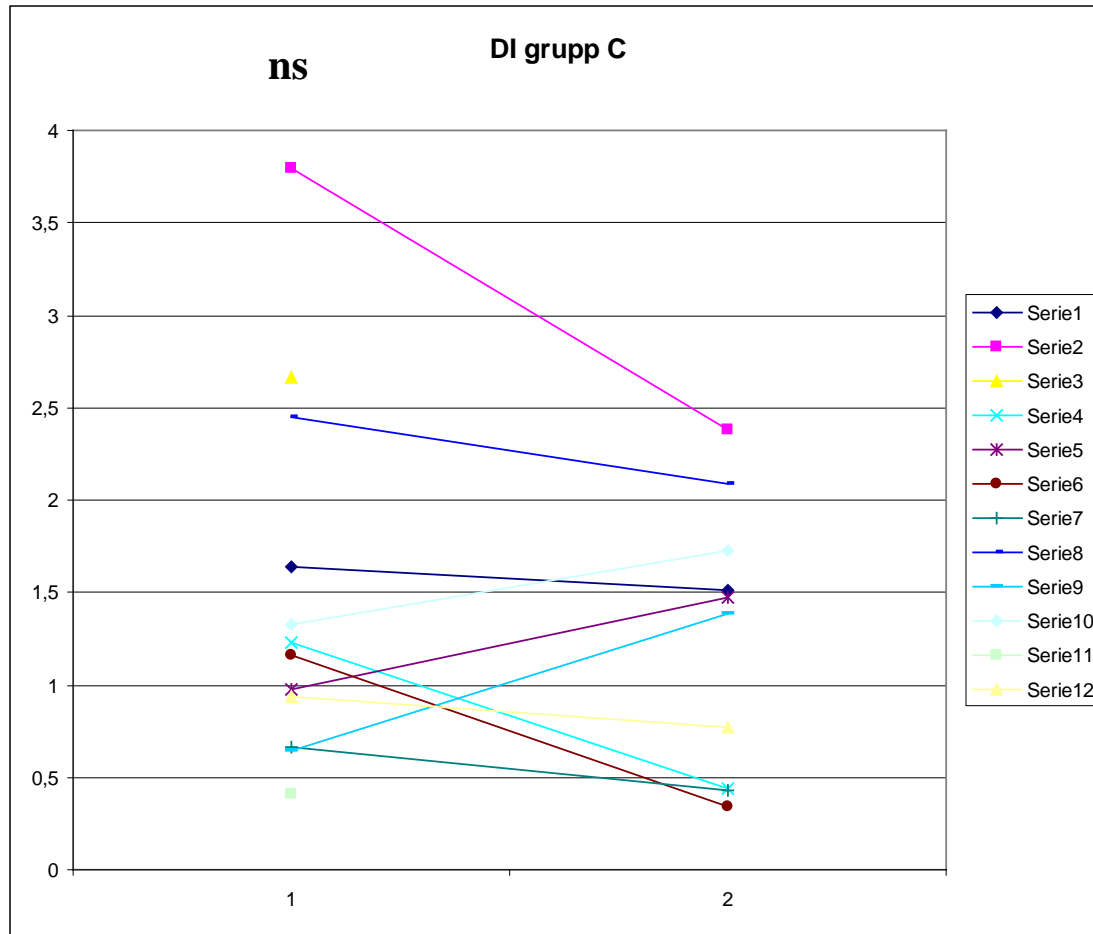
Bread A, high GI, low whole grain wheat



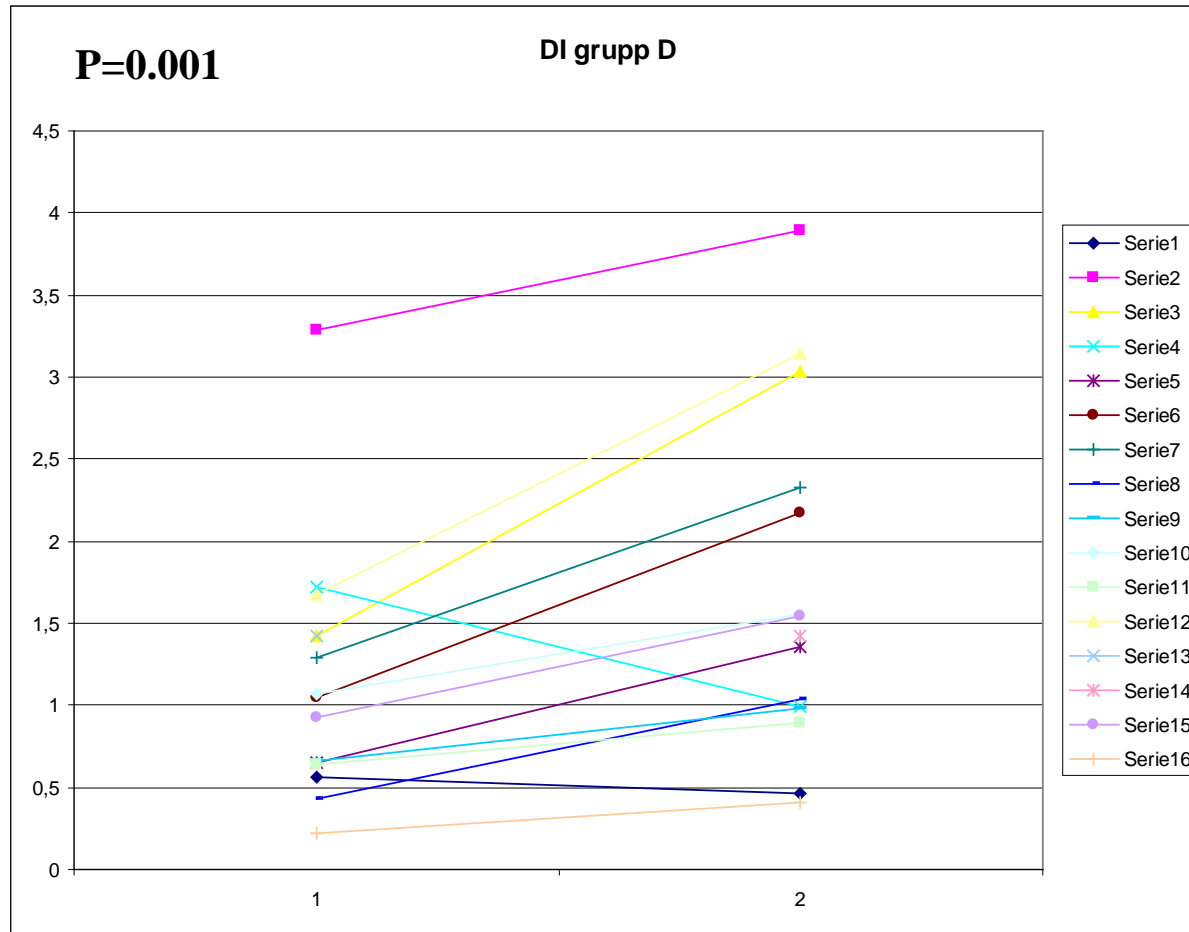
Bread B, high GI, high whole grain wheat



Bread C, low GI, high whole grain wheat kernel



Bread D, low GI, high whole grain barley kernel



Conclusion

- **A low GI, high whole grain barley kernel bread will improve insulin sensitivity measured as KITT and Disposition Index over four weeks in a group of patients with diet-treated diabetes type 2.**

