



A.D.I. Sez. Veneto

CONGRESSO CONGIUNTO ADI-SIO



**IL GELATO**  
piacere, proteine, calcio e vitamina D

# Il gelato nel paziente diabetico

**Agostino Paccagnella**

U.O. Malattie Metaboliche e Nutrizione Clinica

Azienda ULSS 9 - Treviso



## IL GELATO

piacere, proteine, calcio e vitamina D

...e gli zuccheri?





## GELATO ARTIGIANALE

La ricetta varia in base al produttore;  
gli ingredienti di base:

Latte intero (60-75%), zucchero (14-24%), panna (5-20%), aromi.

**100 g di GELATO**  
**CARBOIDRATI = 20-27 g**  
**GRASSI = 11-14 g**  
**PROTEINE = 3,5-4,5 g**

**1 PALLINA= 60 g**  
**CARBOIDRATI = 12-16 g**  
**GRASSI = 6,6-8,4 g**  
**PROTEINE = 2,1-2,7 g**



**1 PALLINA= 60 g**

**CARBOIDRATI = 12-16 g**

**GRASSI = 6,6-8,4 g**

**PROTEINE = 2,1-2,7 g**

**UNA COPPA BANANA SPLIT CON 3  
PALLINE = 63.4 g CHO**

**(16 g/pallina media x 3palline = 48 g CHO)**

**+ 1 BANANA da 100 g (15.4 g CHO) = 63.4 g**

# GELATO INDUSTRIALE

## Gelato al cioccolato

### Ingredienti

Latte scremato reidratato - Siero di latte scremato parzialmente delattosato reidratato - Zucchero - Sciroppo di glucosio - Olio di cocco - Cacao (6%) - Cioccolato (2%)(Pasta di cacao, Zucchero, Cacao magro) - Emulsionante: mono e digliceridi degli acidi grassi - Stabilizzanti: alginato di sodio, farina di semi di carrube.



| Valori Nutrizionali | per 100 g     |
|---------------------|---------------|
| Proteine            | g 3,4         |
| <b>Carboidrati</b>  | <b>g 25,3</b> |
| Grassi              | g 10,9        |
| Valore energetico   | 217 kcal      |

**Per una pallina di circa 60 g.**

**CARBOIDRATI = 15 g.**



# GELATO VEGETALE BIANCO E CACAO



## Ingredienti

Estratto di soia (65%) (acqua, semi di soia (8,2%), sale marino), destrosio, zucchero, sciroppo di glucosio, grasso vegetale, cacao magro (2,5%), gocce di cacao (0,75%) (pasta di cacao, burro di cacao, zucchero, vanillina, emulsionante: lecitina di soia), emulsionanti: mono- e digliceridi degli acidi grassi – esteri di saccarosio degli acidi grassi, stabilizzanti: alginato di sodio – farina di semi di carrube – gomma di guar, aromi.

## Valori Nutrizionali per 100 g

Valore Energetico: 184 kcal

Proteine: 2,8 g

Carboidrati: 25.5 g

Grassi: 7.7g

Fibre: 0,9 g

**UNA PALLINA = 60 g**

**CARBOIDRATI = 15,5 g**

| GELATO VEGETALE 60 gr (1 PALLINA) | CARBOIDRATI (g) |
|-----------------------------------|-----------------|
| VARIEGATO AMARENA                 | 18.4            |
| AFFOGATO AL CACAO                 | 16.6            |
| ORZOMALTO                         | 12.1            |
| VANIGLIA GIANDUIA                 | 10.8            |
| BIANCO CACAO                      | 15.5            |

## CONFRONTO CONTENUTO DI CARBOIDRATI IN UNA PALLINA DA 60 g

| <b>GELATO VEGETALE</b><br>60 g = 1 pallina | <b>CARBOIDRATI</b><br><b>(g)</b> |
|--------------------------------------------|----------------------------------|
| VARIEGATO AMARENA                          | 18.4                             |
| AFFOGATO AL CACAO                          | 16.6                             |
| ORZOMALTO                                  | 12.1                             |
| VANIGLIA GIANDUIA                          | 10.8                             |
| BIANCO CACAO                               | 15.5                             |

| <b>BARATTOLINI</b><br>60 g = 1 pallina | <b>CARBOIDRATI</b><br><b>(g)</b> |
|----------------------------------------|----------------------------------|
| AL CIOCCOLATO                          | 15                               |
| VANIGLIA<br>CIOCCOLATO                 | 15.7                             |
| LIMONE E FRAGOLA                       | 16.5                             |
| PESCA E VANIGLIA                       | 20.2                             |
| CREMA                                  | 16.3                             |

| <b>GELATO VASCHETTA</b><br>60 g = 1 pallina | <b>CARBOIDRATI</b><br><b>(g)</b> |
|---------------------------------------------|----------------------------------|
| VANIGLIA                                    | 16.8                             |
| FIORDILATTE CIOCCOLATO                      | 16.8                             |
| PANNA                                       | 13.2                             |
| STRACCIATELLA                               | 18                               |
| SORBETTO ALLA FRAGOLA                       | 16.2                             |

**1 PALLINA = 60 g**

**CHO = 12-20 g**



## **CORNETTO CLASSICO**

### **INGREDIENTI**

Gelato alla crema di latte con cialda (13%), copertura al cacao magro (13%) e con granella di nocciole e meringhe (3,5%).

Ingredienti: latte scremato reidratato, zucchero, olio vegetale, farina di grano tenero, sciroppo di glucosio-fruttosio, granella di nocciole, burro concentrato (da latte), panna (da latte) (2,5%), sciroppo di glucosio, cacao magro in polvere, latte scremato in polvere o concentrato, amido di patata, emulsionanti (mono- e digliceridi degli acidi grassi, lecitina di girasole, fosfatidi d'ammonio), sale, addensanti (alginato di sodio), sciroppo di zucchero caramellato, aroma naturale di vaniglia, aromi naturali, amido di frumento, proteine del latte, albume d'uovo. Può contenere altra frutta secca a guscio e arachidi. Tracce di altra frutta secca a guscio e arachidi.

## **CARBOIDRATI PER PORZIONE**

**(75 GRAMMI DI GELATO)**

**= 25 GRAMMI**





## **RICOPERTO «EXTRA LARGE»**

Ingredienti: latte scremato reidratato, zucchero, burro di cacao\*, olio vegetale, pasta di cacao\*, sciroppo di glucosio-fruttosio, latte intero in polvere, lattosio e proteine del latte, burro concentrato (da latte), sciroppo di glucosio, emulsionanti (E471, lecitina di soia, E476), addensanti (E410, E412, E407), baccelli di vaniglia, aromi, coloranti (E160a).

**CONTENUTO DI  
CARBOIDRATI:  
25 g/porzione**

**PER GLI ALTRI GELATI CONFEZIONATI,  
CALCOLARE IL CONTENUTO DI CARBOIDRATI E'  
FACILE! E' SUFFICIENTE LEGGERLO IN  
ETICHETTA**

# SONO DIABETICO?

**GELATO = IPERGLICEMIA**





ESISTE UNA SOLUZIONE?



# **SOLUZIONE**

## **LA CONTA DEI CARBOIDRATI**

**IN BASE AL CONTENUTO DI  
CARBOIDRATI CHE  
IMPARO A QUANTIFICARE  
IN OGNI PASTO**

**CONOSCO IL  
QUANTITATIVO DI  
INSULINA DA  
SOMMINISTRARE**

**RIDUCO AL MINIMO LE  
ESCURSIONI GLICEMICHE**

**è un metodo che permette di stabilire quanta insulina serve per metabolizzare gli zuccheri assunti in ciascun pasto**

**Tanti CHO**



**Tanta  
INSULINA**

# Conta dei Carboidrati

Same impact on blood sugar:



30 grams of carb  
1 cup serving

=



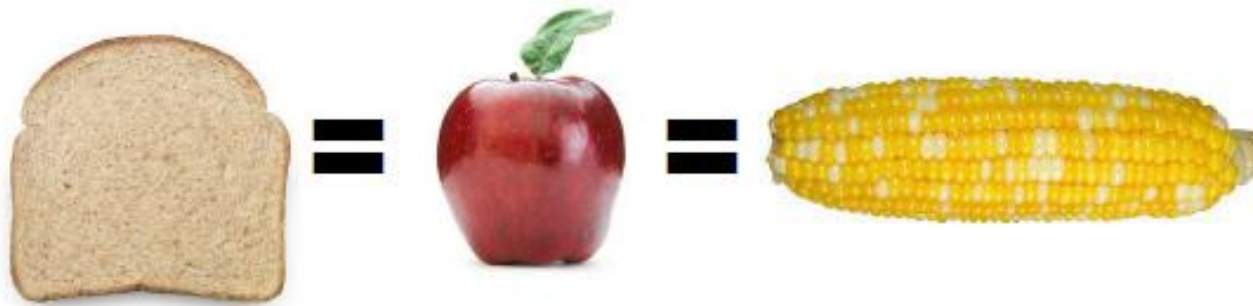
30 grams of carb  
2 oz. roll

=



30 grams of carb  
2/3 cup





Same impact on blood sugar:



30 grams of carb  
1 cup serving



30 grams of carb  
2 oz. roll



30 grams of carb  
2/3 cup

All of these foods contain starches:

### Starchy Vegetables

Regular and sweet potatoes, corn, fresh peas and lima beans



### Legumes

Dried beans and peas



### Grains

Grains like wheat, oats, barley, and rice



### Products made from grains,

such as pasta, bread, rolls, bagels, crackers, cereals and baked goods



All of these foods contain sugars:

**Fruit and fruit juices**  
Foods that contain fruit or fruit juices such as jams, jellies, and fruit smoothies



**Sweet bakery products**  
such as cake with icing, pie, donuts, candy, and cookies



**Sugary drinks**  
such as regular soda and fruit drinks



**Sweet condiments**  
such as barbeque sauce, relish and ketchup



**Milk and yogurt**



# Conta dei Carboidrati

Per apprendere la conta dei carboidrati **BISOGNA**:

1. Identificare gli alimenti che contengono carboidrati, proteine e lipidi
2. Imparare quanti carboidrati sono contenuti nei vari alimenti
3. Stimare accuratamente le porzioni di cibo
4. Sapere individuare il proprio rapporto I/CHO
5. Saper variare la dose di insulina in base ai CHO



# Conta dei Carboidrati

## Pizza



Typical values

|                 | Per ½ pizza | Per 100g |
|-----------------|-------------|----------|
| Energy          |             | 281kcal  |
| Carbohydrate    |             | 30.9g    |
| of which sugars |             |          |
| Fat             |             |          |

\* Guideline Daily Amount (GDA) based on a 2000 kcal diet

## Fruit Biscuits



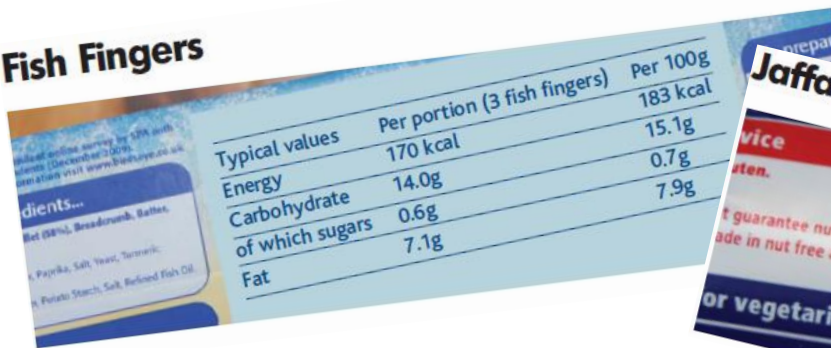
Typical values

|                 | Per pack (3 biscuits) | Per 100g |
|-----------------|-----------------------|----------|
| Energy          | 165kcal               | 381kcal  |
| Carbohydrate    | 32.7g                 | 75.2g    |
| of which sugars | 16.2g                 | 37.4g    |
| Fat             |                       | 6.4g     |

SUITABLE FOR VEGETARIANS



## Fish Fingers



Typical values

|                 | Per portion (3 fish fingers) | Per 100g |
|-----------------|------------------------------|----------|
| Energy          | 170 kcal                     | 183 kcal |
| Carbohydrate    | 14.0g                        | 15.1g    |
| of which sugars | 0.6g                         | 0.7g     |
| Fat             | 7.1g                         | 7.9g     |

## Jaffa Cakes



Typical values

|                 | Per Jaffa cake | Per 100g |
|-----------------|----------------|----------|
| Energy          | 42 kcal        | 370 kcal |
| Carbohydrate    | 7.6g           | 67.6g    |
| of which sugars | 6.0g           | 53.3g    |
| Fat             | 1.0            | 8.8g     |

30



[Diabet Med.](#) 2010;27:348-53..

## **Can children with Type 1 diabetes and their caregivers estimate the carbohydrate content of meals and snacks?**

[Smart CE](#), [Ross K](#), [Edge JA](#), [King BR](#), [McElduff P](#), [Collins CE](#).

**CONCLUSIONS:** Repeated age-appropriate education appears necessary to maintain accuracy in carbohydrate estimations



# Conta dei Carboidrati

## Pizza



## Fish Fingers



## Jaffa Cakes



Come costruire il proprio  
rapporto  
carboidrati/insulina?

**Il rapporto I/CHO è determinato in base a:**

- 1) Regola del 500 (*teorico*)
- 2) Diario alimentare, n° unità di insulina glicemia pre-post (*pratico*)

# Il rapporto carboidrati / insulina utilizzando una formula

Se utilizziamo un analogo rapido  
possiamo calcolare:

500

---

Dose totale media insulina giornaliera

Se si utilizzano 40 U.I./Insulina al giorno:

$$500 / 40 = 12.5$$

Rapporto: CHO/ Insulina = 12.5 / 1

... cioè servirà 1 U.I.  
di Insulina per  
metabolizzare 12.5 g  
CHO



***Oggi a pranzo MANGIO ....***

***Ci sono circa .... g CHO***

***La glicemia di partenza è .....***

***La dose di insulina sarà di UI....***



# Il menù

- Pappardelle di pasta secca al sugo d'anatra o a scelta al ragù o al pomodoro
- Straccetti di tacchino al cherry
- Spinaci al burro + patate arroste
- Frutta: mandarini , kiwi, mele, pere
- Pane, acqua , vino e caffè

# Le ricette

Pappardelle al ragù

pasta 70 g; ragù 40 g; grana 10 g

Spinaci al burro

spinaci 150g; burro 10g; patate 150 g; burro 20g

Frutta

media 150 g

Pane 30g

# Toto conta



**CHO 54 g PASTA**

**5 g SUGO**

**TOT 59 g**



Patate arroste 150 g

**CHO 30 g**



Spinaci 150 g

**CHO 5 g**



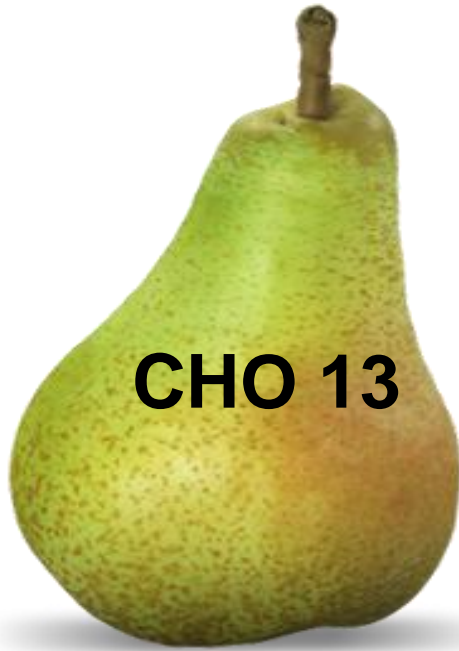
## **POLLO AL CURRY**

**senza riso**

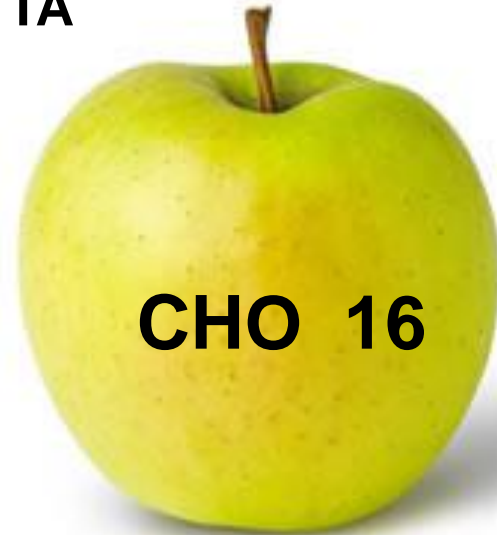
**CHO 6 g**



150 g DI FRUTTA



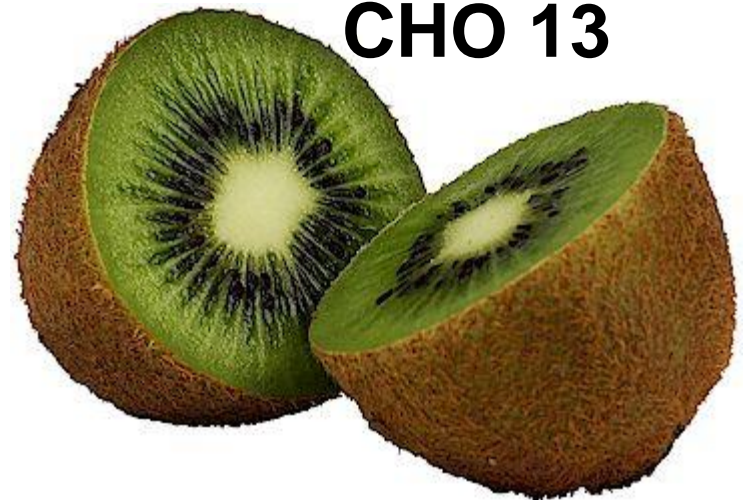
**CHO 13**



**CHO 16**



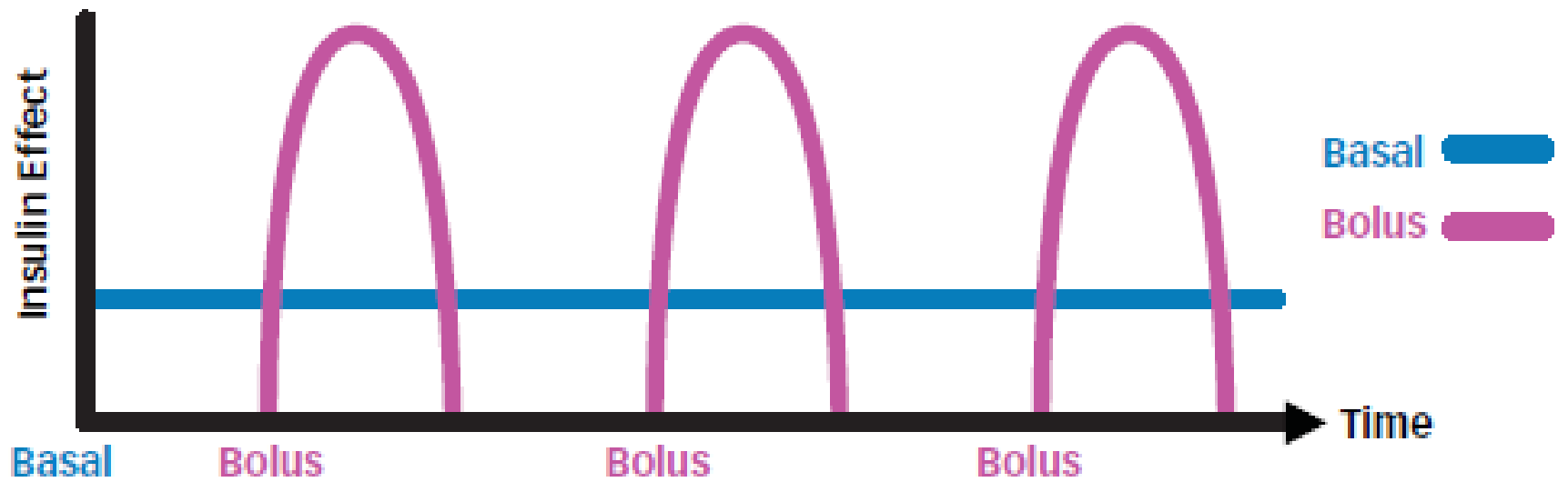
**CHO 26**



**CHO 13**



## Basal and Bolus Insulin Effect



# FORMULA PER LA CORREZIONE DELL'ECCEDEXENZA GLICEMICA

**(1800)/UI totali die**

**Trovo di quanto si riduce glicemia (mg)**

**con 1 UI**

**Es. 1800: (8+10+8+22)=**

**1800:48 = 37.5**

**1 U.I. insulina riduce la glicemia di 37,5 mg/dl**

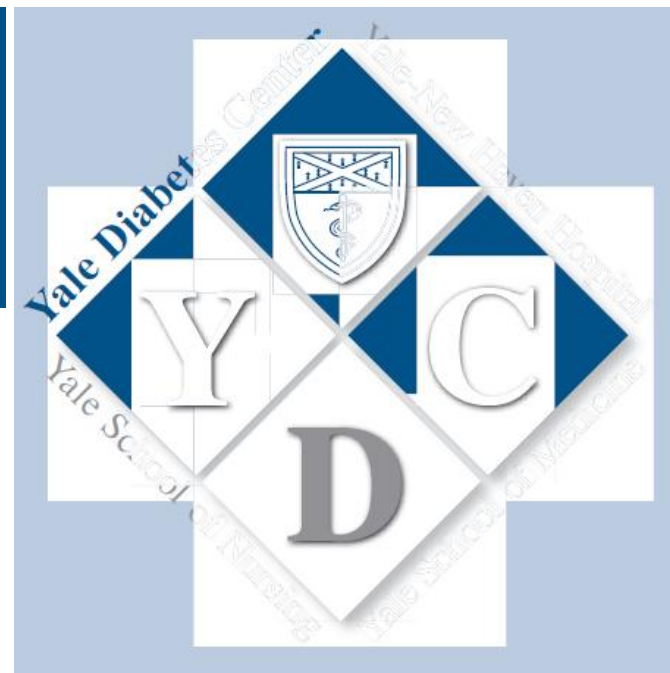
# Noi abbiamo contato così

| PIETANZA                             | QUANTITA'                        | PROTEINE | LIPIDI    | GLUCIDI   | KCAL       |
|--------------------------------------|----------------------------------|----------|-----------|-----------|------------|
| Lasagne all'emiliana                 | 150                              | 22       | 19        | 32        | 387        |
| Conchiglie alla mediterranea         | 80 g pasta sugo ricetta classica | 15       | 11        | 64        | 399        |
| Pasta s/ glutine alla mediterranea   |                                  | 13       | 11        | 63        | 397        |
| Arista di maiale al forno            | 120                              | 24.84    | 13.4      | 0.5       | 191        |
| Hamburger ai ferri                   | 100                              | 21.8     | 5.2       | 0         | 134        |
| Piselli stufati                      | 100                              | 7        | 7         | 14        | 84         |
| Verdura cruda mista condita          | 150                              | 2        | 10        | 6         | 122        |
| <b>Gelato gusto frutta 2 palline</b> | <b>120</b>                       | <b>4</b> | <b>10</b> | <b>29</b> | <b>222</b> |
| Pane rosetta                         | 50                               | 4        | 1         | 29        | 141        |
| Pane s/glutine (media vari prodotti) | 50                               | 1,5      | 1,7       | 23        | 114        |
| Frutta: pesche                       | 150                              | 1.05     | 0         | 9         | 38         |
| uva                                  | 150                              | 0.75     | 0         | 23        | 91         |
| prugne                               | 150                              | 0.75     | 0         | 16        | 63         |
| Mele                                 | 150                              | 0.6      | 0.15      | 16        | 64         |

# Diabetes Facts and Guidelines

Silvio E. Inzucchi, M.D.

2011



## ❖ Nutrition/Diet Therapy

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The goal of nutritional therapy in diabetes is to achieve/maintain:

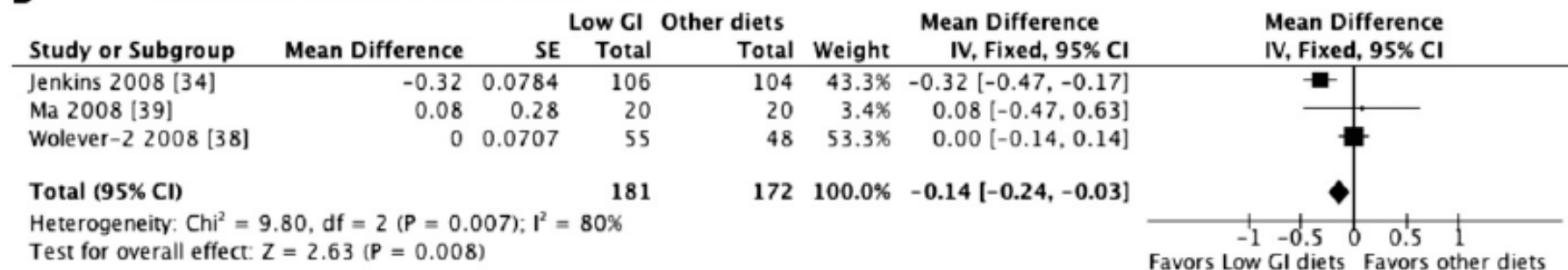
- 1) ideal body weight,
- 2) blood glucose levels in the target range, and
- 3) optimal blood lipids.

# Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes<sup>1-3</sup>

Olubukola Ajala, Patrick English, and Jonathan Pinkney

*Am J Clin Nutr* 2013;97:505-16.

## B Difference in low-GI versus other diets



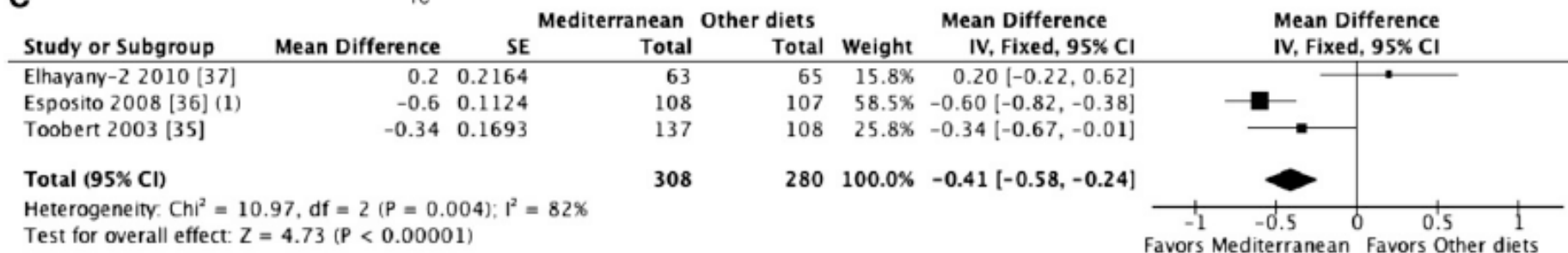
Difference in low-GI vs. 'other' diets. 'Other' diets compared were high fiber (Jenkins [35]), high GI (Wolever-2 [38]), ADA (Ma [39]). Wolever-2 [38] is the comparison between the low-GI and high-GI arms of the study.

# Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes<sup>1-3</sup>

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*Am J Clin Nutr* 2013;97:505-16.

## C Difference in Hb A<sub>1c</sub> Mediterranean versus other diets



(1) For Esposito 2008, data for outcome at 1 year

Difference in Mediterranean vs. 'other' diets. 'Other' diets were 'usual care' (Toobert [36]), ADA (Esposito [36]) and Elhayany-2 [37]).

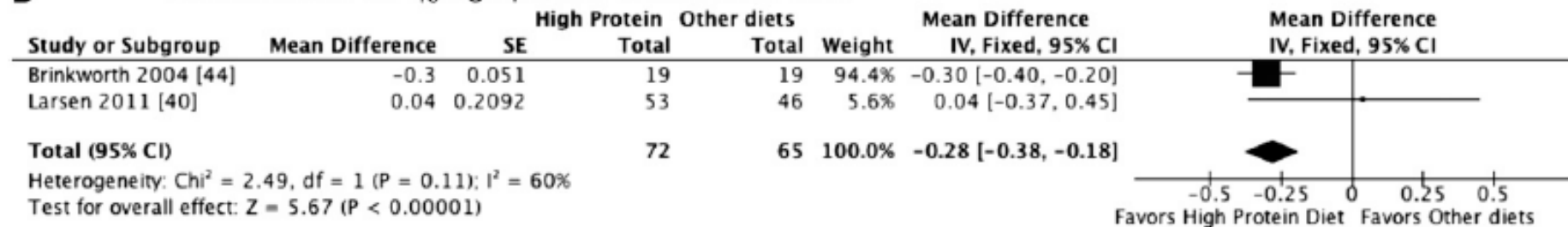
Elhayany-2 [37] is the comparison between the traditional Mediterranean and ADA arms of the study.

# Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes<sup>1-3</sup>

Olubukola Ajala, Patrick English, and Jonathan Pinkney

*Am J Clin Nutr* 2013;97:505-16.

## D Difference in Hb A<sub>1c</sub> high-protein versus other diets



Difference in high protein vs. 'other' diets. 'Other' diets compared were low protein (Brinkworth [44]) and high carbohydrate (Larsen [40]).



# Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes<sup>1-3</sup>

Olubukola Ajala, Patrick English, and Jonathan Pinkney

*Am J Clin Nutr* 2013;97:505-16.

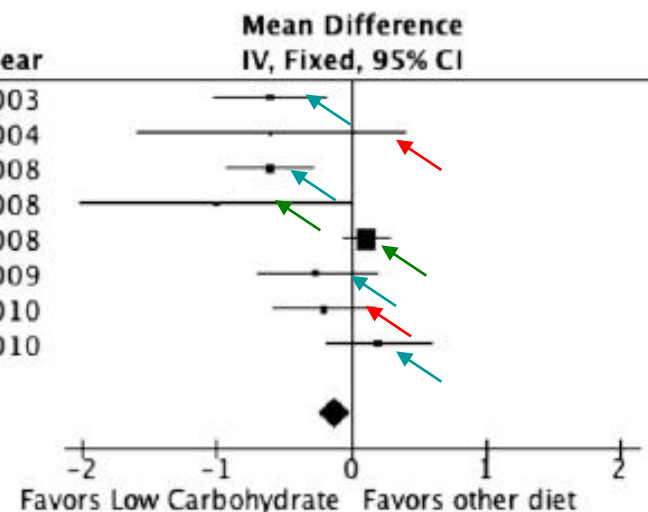
**A**

Difference in Hb A<sub>1c</sub> low-carbohydrate versus other diets

| Study or Subgroup     | Mean Difference | SE     | Weight        | Mean Difference<br>IV, Fixed, 95% CI | Year |
|-----------------------|-----------------|--------|---------------|--------------------------------------|------|
| Samaha 2003 [32]      | -0.6            | 0.2133 | 8.1%          | -0.60 [-1.02, -0.18]                 | 2003 |
| Stern 2004 [33]       | -0.6            | 0.5102 | 1.4%          | -0.60 [-1.60, 0.40]                  | 2004 |
| Haimoto 2008 [8]      | -0.6            | 0.1611 | 14.1%         | -0.60 [-0.92, -0.28]                 | 2008 |
| Westman 2008 [42]     | -1              | 0.5173 | 1.4%          | -1.00 [-2.01, 0.01]                  | 2008 |
| Wolever-1 2008 [38]   | 0.11            | 0.0868 | 48.6%         | 0.11 [-0.06, 0.28]                   | 2008 |
| Davis 2009 [7]        | -0.26           | 0.2254 | 7.2%          | -0.26 [-0.70, 0.18]                  | 2009 |
| Elhayany-1 2010 [37]  | -0.2            | 0.191  | 10.0%         | -0.20 [-0.57, 0.17]                  | 2010 |
| Iqbal 2010 [43]       | 0.2             | 0.2    | 9.2%          | 0.20 [-0.19, 0.59]                   | 2010 |
| <b>Total (95% CI)</b> |                 |        | <b>100.0%</b> | <b>-0.12 [-0.24, -0.00]</b>          |      |

Heterogeneity: Chi<sup>2</sup> = 27.86, df = 7 (P = 0.0002); I<sup>2</sup> = 75%

Test for overall effect: Z = 2.02 (P = 0.04)



Difference in low carbohydrate vs. 'other' diets. 'Other' diets compared were low fat (Samaha [32], Haimoto [8], Davis [7] and Iqbal [43]), Low GI (Westman [42] and Wolever-1[38]), Mediterranean (Elhayany-1[37]) and conventional high CHO (Stern [33])

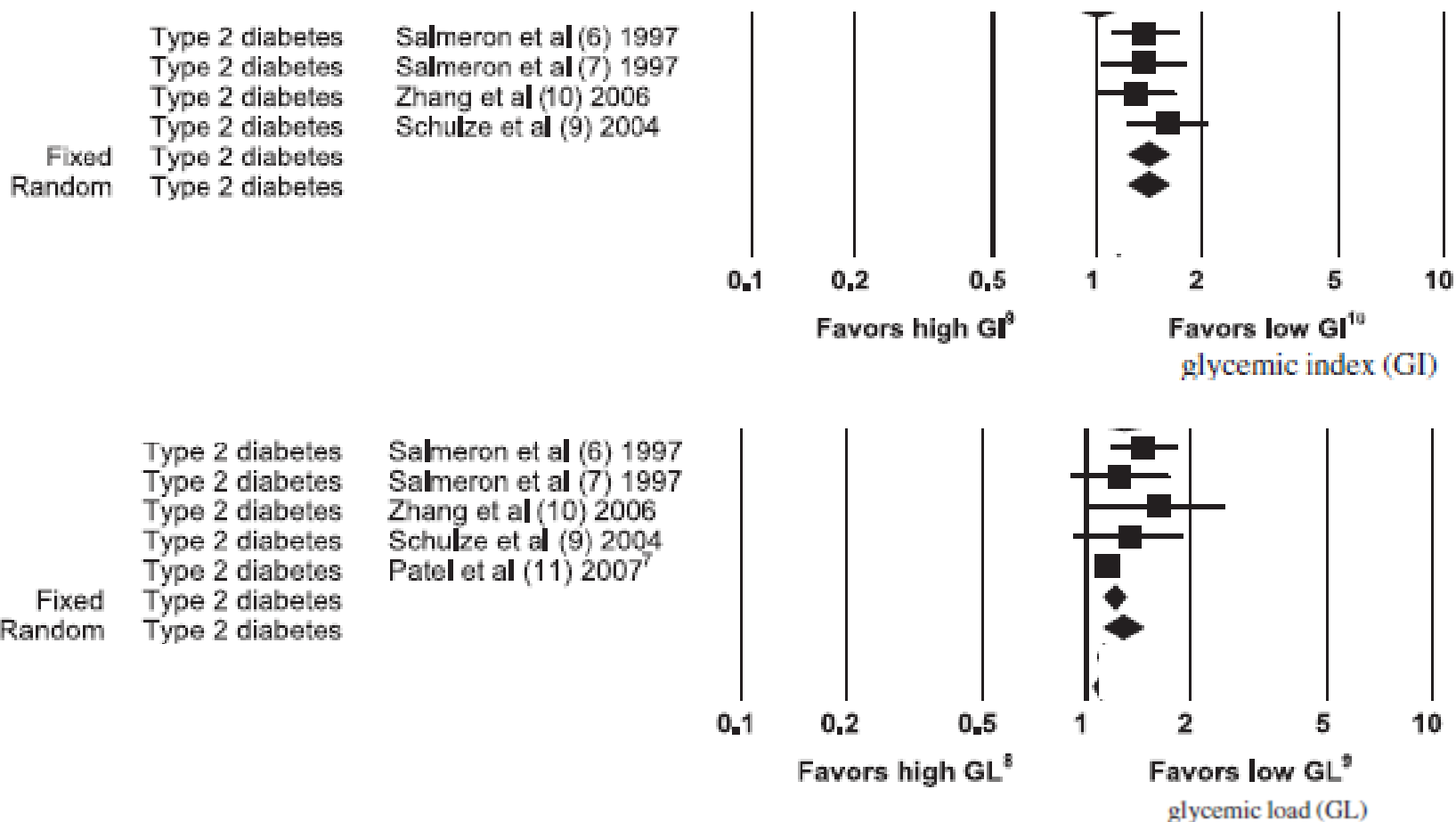
Wolever-1 [38] is the comparison between the low-CHO and low-GI arms of the study.

Elhayany-1 [37] is the comparison between the traditional Mediterranean and low-CHO arms of the study.

# Glycemic index, glycemic load, and chronic disease risk—a meta-analysis of observational studies<sup>1,2</sup>

Alan W Barclay, Peter Petocz, Joanna McMillan-Price, Victoria M Flood, Tania Prvan, Paul Mitchell, and Jennie C Brand-Miller

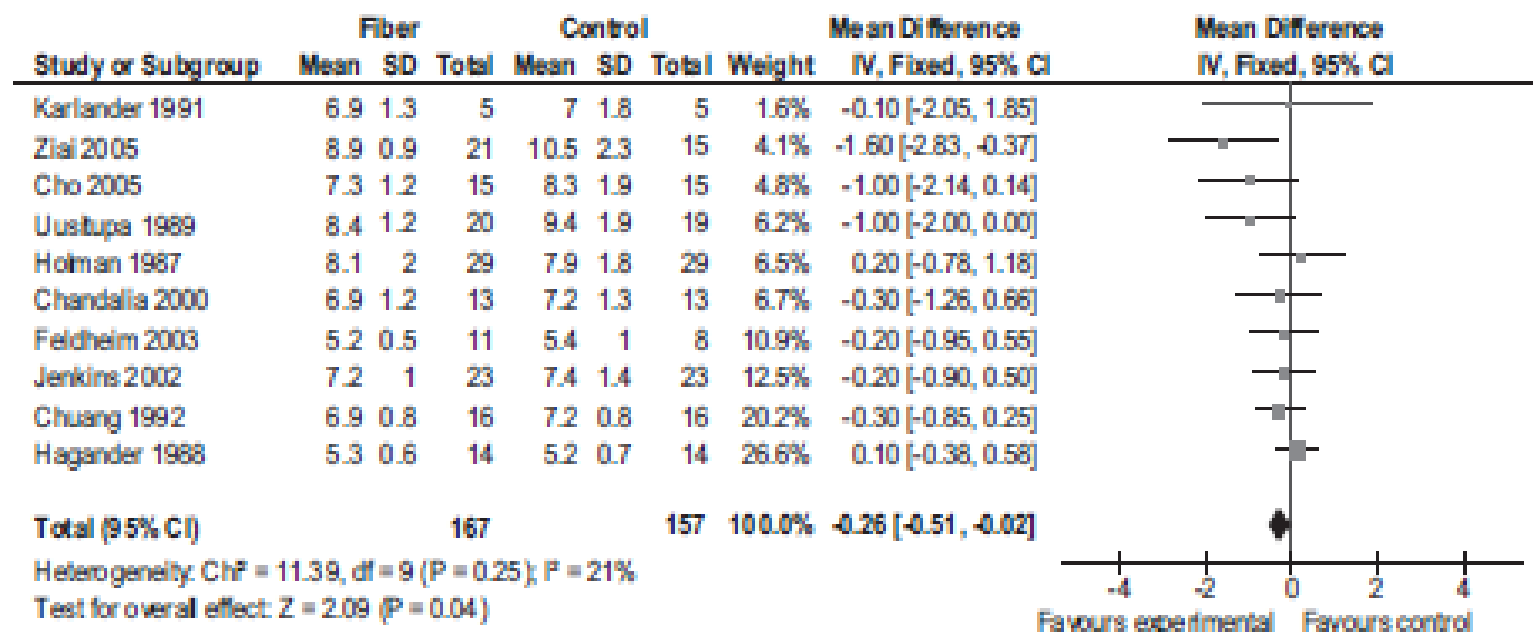
*Am J Clin Nutr* 2008;87:627–37.



# Dietary Fiber for the Treatment of Type 2 Diabetes Mellitus: A Meta-Analysis

Robert E. Post, MD, MS, Arch G. Mainous III, PhD, Dana E. King, MD, MS, and Kit N. Simpson, DrPH

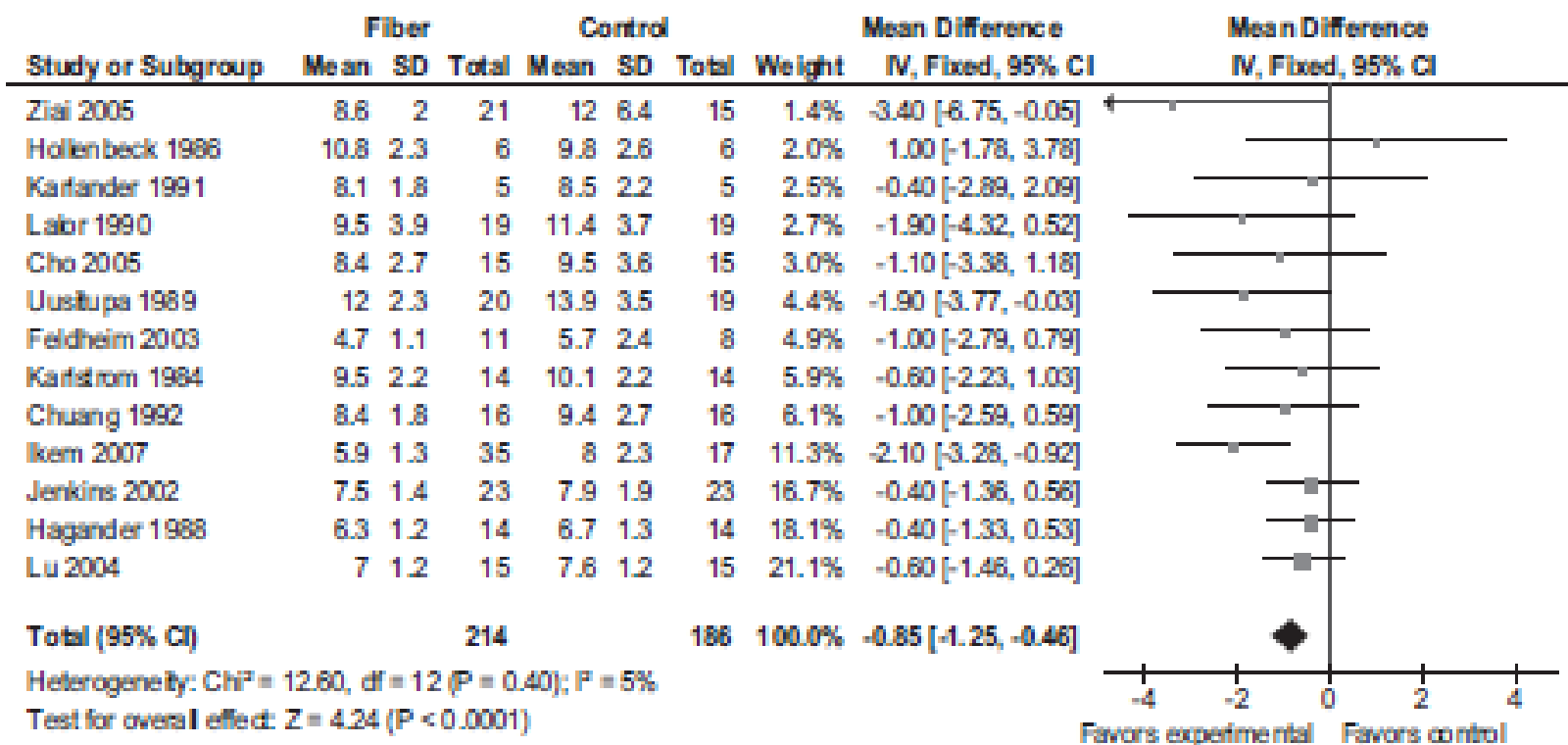
Figure 3. Forest plot for glycosylated hemoglobin.



# Dietary Fiber for the Treatment of Type 2 Diabetes Mellitus: A Meta-Analysis

Robert E. Post, MD, MS, Arch G. Mainous III, PhD, Dana E. King, MD, MS, and Kit N. Simpson, DrPH

Figure 2. Forest plot for fasting blood glucose. Mean, SD, and mean difference are shown in units of mmol/L.



Calcolo Carboidrati

Glicemia - Cibo

Gestire meglio  
il diabete

in piscina

Diabete

A FAVORE

## Randomized nutrition education intervention to improve carbohydrate counting in adolescents with type 1 diabetes study: is more intensive education needed?

[Spiegel G](#), [Bortsov A](#), [Bishop FK](#), [Owen D](#), [Klingensmith GJ](#), [Mayer-Davis EJ](#), [Maahs DM](#).

[J Acad Nutr Diet](#). 2012;112:1736-46.

### **CONCLUSIONS:**

More intensive intervention might be required to improve adolescents' carbohydrate counting accuracy and nutrition management of type 1 diabetes.



A FAVORE

[Acta Diabetol.](#) 2013 Jun 19. [Epub ahead of print]

**Nutritional education and carbohydrate counting in children with type 1 diabetes treated with continuous subcutaneous insulin infusion: the effects on dietary habits, body composition and glycometabolic control.**

[Marigliano M](#), [Morandi A](#), [Maschio M](#), [Sabbion A](#), [Contreas G](#), [Tomasselli F](#), [Tommasi M](#), [Maffeis C](#).

Patients without a significant HbA1c reduction did not show any difference. CHC, in combination with nutritional education, does not affect dietary habits, body composition and body fat distribution in children with T1D treated with CSII. Moreover, the sub-group of subjects showing a significant improvement in glycometabolic control reported an increase in CHO intake and a reduction in fat and protein intake.



A FAVORE

## **Carbohydrate counting accuracy and blood glucose variability in adults with type 1 diabetes.**

[Brazeau AS](#), [Mircescu H](#), [Desjardins K](#), [Leroux C](#), [Strychar I](#), [Ekoé JM](#), [Rabasa-Lhoret R](#).

[Diabetes Res Clin Pract.](#) 2013;99:19-23

### **CONCLUSION:**

Inaccurate carbohydrate counting is frequent and associated with higher daily blood glucose variability in adults with type 1 diabetes

A FAVORE

[MCN Am J Matern Child Nurs.](#) 2012;37:88-94.

## **In-hospital survival skills training for type 1 diabetes: perceptions of children and parents.**

[Schmidt CA](#), [Bernaix LW](#), [Chiappetta M](#), [Carroll E](#), [Beland A](#).

### **CLINICAL IMPLICATIONS:**

Implications for care include age-appropriate information in a variety of formats, minimizing the invasive nature of the treatment, providing opportunities for demonstration/return demonstration of skills, providing positive support and reassurance, and delivering concentrated instruction related to carbohydrate counting.

**Exponential increase in postprandial blood-glucose exposure with increasing carbohydrate loads using a linear carbohydrate-to-insulin ratio.**

[Marran KJ](#), [Davey B](#), [Lang A](#), [Segal DG](#).

[S Afr Med J](#). 2013;10:461-3

**CONCLUSION:**

A non-linear relationship exists between carbohydrates consumed and the insulin required to cover them. This has implications for control of postprandial blood sugars, especially when consuming large carbohydrate loads.

# Risk behaviors for eating disorder in adolescents and adults with type 1 diabetes

Sonia Tucunduva Philippi, Milena Gonçalves Lima Cardoso, Priscila Koritar, Marle Alvarenga

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**Table 4** Qualitative variables according to the risk or non-risk of eating disorders among patients with type 1 diabetes (n=189)

| Qualitative variables      | Eating disorder risk, n (%) |           | p-value |
|----------------------------|-----------------------------|-----------|---------|
|                            | No                          | Yes       |         |
| Gender                     |                             |           |         |
| Male                       | 33 (42.3)                   | 15 (13.5) | < 0.001 |
| Female                     | 45 (57.7)                   | 96 (86.5) |         |
| Body mass index            |                             |           |         |
| Underweight                | 2 (2.6)                     | 5 (4.5)   | 0.009   |
| Normal range               | 61 (78.2)                   | 63 (56.8) |         |
| Overweight                 | 15 (19.2)                   | 43 (38.7) |         |
| Long-acting insulin type   |                             |           |         |
| Novolin                    | -                           | 1 (0.9)   | 0.021   |
| Glargine                   | 39 (50.0)                   | 37 (33.3) |         |
| Detemir                    | 4 (5.1)                     | 4 (3.6)   |         |
| Humulin                    | 3 (3.8)                     | 5 (4.5)   |         |
| NPH                        | 29 (32.7)                   | 64 (57.7) |         |
| Insulin reduction/omission |                             |           |         |
| Yes                        | 1 (1.3)                     | 15 (13.5) | 0.003   |
| No                         | 77 (98.7)                   | 96 (86.5) |         |
| Carbohydrate counting      |                             |           |         |
| Yes                        | 48 (61.5)                   | 49 (44.1) | 0.019   |
| No                         | 30 (38.5)                   | 62 (55.9) |         |
| Body dissatisfaction       |                             |           |         |
| Yes                        | 45 (57.7)                   | 99 (89.2) | < 0.001 |
| No                         | 33 (42.3)                   | 12 (10.8) |         |

CONTRO

# Development and Validation of the Type 1 Diabetes Nutrition Knowledge Survey

ALISHA J. ROVNER, PHD<sup>1</sup>  
 TONJA R. NANSEL, PHD<sup>1</sup>  
 SANJEEV N. MEHTA, MD, MPH<sup>2</sup>

LAURIE A. HIGGINS, MS, RD, LDN, CDE<sup>2</sup>  
 DENISE L. HAYNIE, PHD, MPH<sup>1</sup>  
 LORI M. LAFFEL, MD, MPH<sup>2</sup>

Table 2—Item difficulty and item discrimination of each question on the NKS

|                                                                                 | Item difficulty* |            | Item discrimination** |            |
|---------------------------------------------------------------------------------|------------------|------------|-----------------------|------------|
|                                                                                 | Child (%)        | Parent (%) | Child (%)             | Parent (%) |
| <b>Healthful eating</b>                                                         |                  |            |                       |            |
| Q1. Benefits of fruits and vegetables                                           | 66               | 89         | 48                    | 31         |
| Q2. High-fiber food                                                             | 45               | 86         | 63                    | 38         |
| Q3. Food with healthy fat                                                       | 44               | 92         | 53                    | 26         |
| Q5. Food with most vitamins and minerals                                        | 59               | 93         | 55                    | 25         |
| Q6. Food that is not a whole grain                                              | 66               | 96         | 63                    | 14         |
| Q7. Benefits of whole grains                                                    | 56               | 90         | 54                    | 25         |
| <b>Carbohydrate counting</b>                                                    |                  |            |                       |            |
| Q4. Fruit with more than 15 g of carbs                                          | 40               | 58         | 39                    | 52         |
| Q11. Food that isn't a "free" food                                              | 31               | 32         | 2                     | 25         |
| Q19. Grams of carbs in 1 cup (8 oz.) milk                                       | 77               | 74         | 43                    | 43         |
| Q20. Grams of carbs in 1 cup cooked pasta                                       | 46               | 56         | 51                    | 42         |
| Q21. Grams of carbs in 1/2 cup corn                                             | 46               | 68         | 40                    | 50         |
| Q22. Grams of carbs in small salad                                              | 57               | 69         | 50                    | 14         |
| Q23. Grams of carbs in 1 cup green beans                                        | 27               | 23         | 14                    | 20         |
| <b>Blood glucose response to food</b>                                           |                  |            |                       |            |
| Q8. Food that causes fastest rise in blood glucose                              | 42               | 35         | 2                     | 31         |
| Q9. Food that causes slowest rise in blood glucose                              | 51               | 66         | 34                    | 48         |
| Q10. Meaning of "no added sugar"                                                | 71               | 81         | 45                    | 43         |
| <b>Nutrition label reading (two food labels: can of chili and sports drink)</b> |                  |            |                       |            |
| Q12. Cups in one can (chili)                                                    | 78               | 92         | 61                    | 28         |
| Q13. Grams of fiber in 1 cup (chili)                                            | 84               | 94         | 35                    | 22         |
| Q14. Grams of carbs in one serving (chili)                                      | 82               | 88         | 33                    | 24         |
| Q15. Calculating insulin dose (chili)                                           | 19               | 40         | 39                    | 42         |
| Q16. Servings in one bottle (sports drink)                                      | 82               | 97         | 55                    | 17         |
| Q17. Grams of carbs in one serving (sports drink)                               | 86               | 96         | 52                    | 21         |
| Q18. Grams of carbs in one bottle (sports drink)                                | 59               | 80         | 78                    | 51         |

Each question was multiple-choice with four response options. \*Indicates percent of respondents answering correctly; items were eliminated if >90 or <20% of both youth and parents answered them correctly. \*\*Item discrimination was determined by computing the index of discrimination ([upper group % correct] – [lower group % correct]).