CONGRESSO REGIONALE SID-AMD | Calabria 2024

UMG Dubium sapientiae initium

Dietoterapia e approcci innovativi

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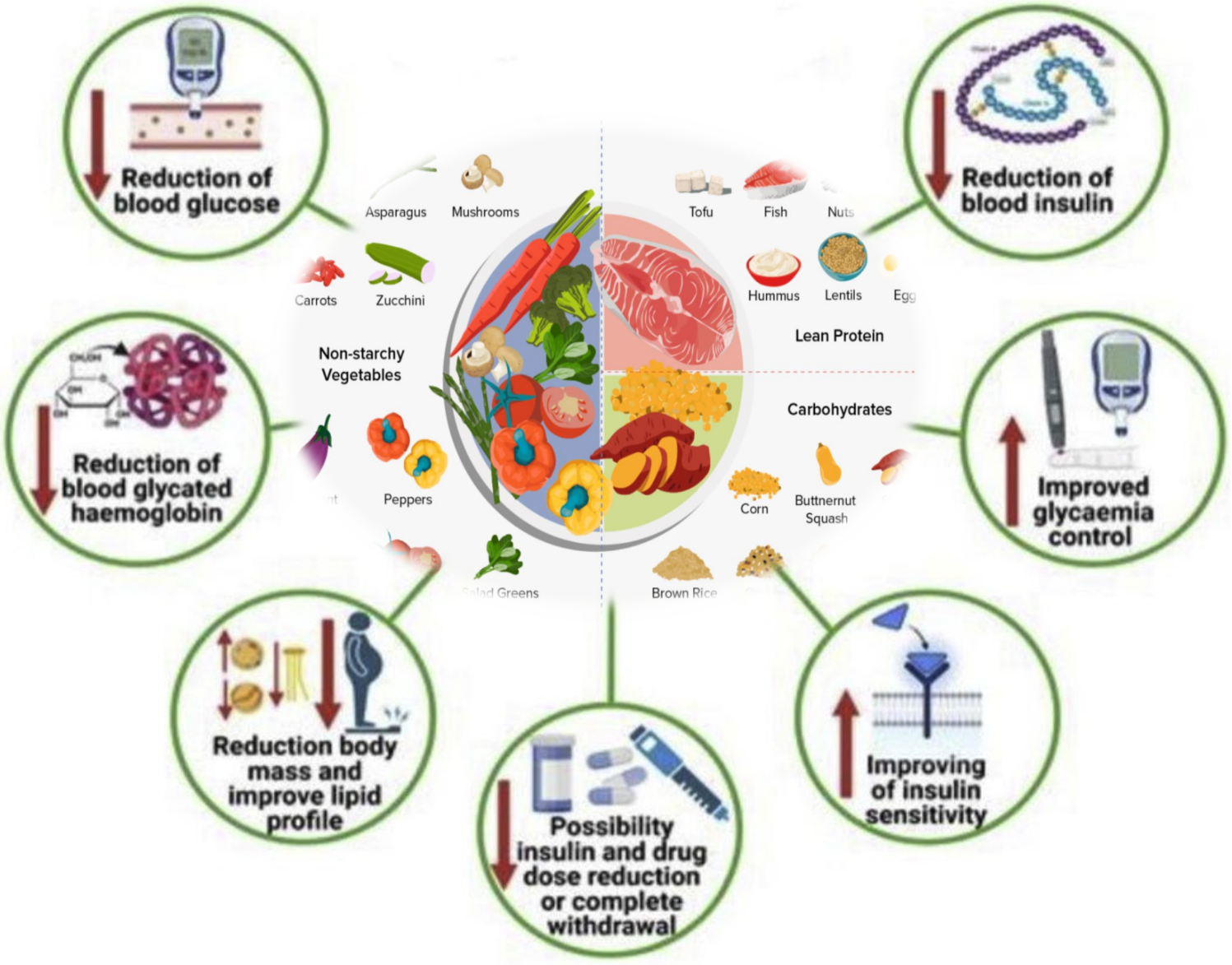
La sottoscritta Elisa Mazza dichiara di NON aver ricevuto negli ultimi due anni compensi o finanziamenti da Aziende Farmaceutiche e/o Diagnostiche

Dichiara altresì il proprio impegno ad astenersi, nell'ambito dell'evento, dal nominare, in qualsivoglia modo o forma, aziende farmaceutiche e/o denominazione commerciale e di non fare pubblicità di qualsiasi tipo relativamente aspecifici prodotti di interesse sanitario (farmaci, strumenti, dispositivi medico-chirurgici, ecc.).

The Role of Nutrition in the Treatment of Diabetes



Samer Younes, Human Nutrition & Metabolism Vol. 35, 2024, 200238 Mod.

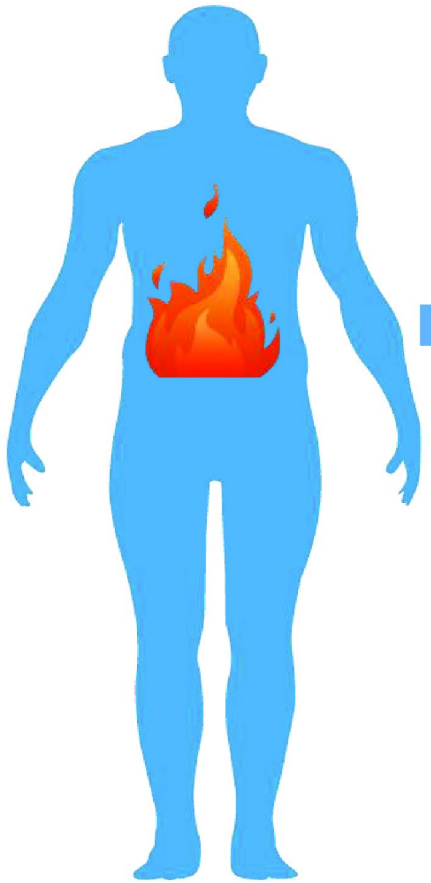
ANTI-INFLAMMATORY DIET AND CHRONIC INFLAMMATION IN DM

Anti-inflammatory diet

PUFAs MUFAs Probiotics
Antioxidants Polyphenols
Fiber Phytochemicals
Vitamins Minerals

Anti-inflammatory dietary components

⬇ Systemic chronic inflammation



- Overall health promotion
- Metabolic wellness
- Cognitive health enhancement
- Chronic disease prevention and management

British Journal of Nutrition , First View , pp. 1 – 21, 2024

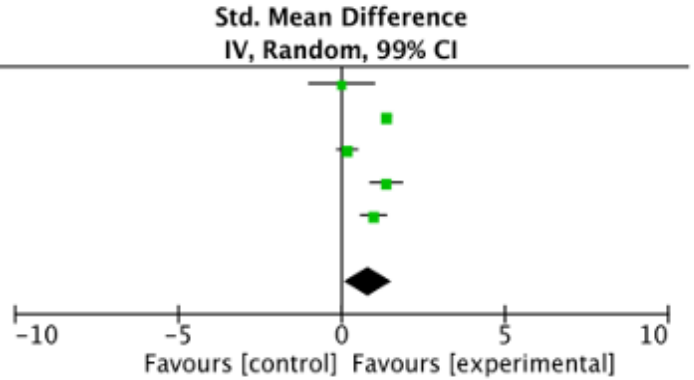
Systematic Review

The Effect of Dietary Patterns on Inflammatory Biomarkers in Adults with Type 2 Diabetes Mellitus: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

Abril I. Sánchez-Rosales [1], Ana L. Guadarrama-López [2], Laura S. Gaona-Valle [3], Beatriz E. Martínez-Carrillo [1] and Roxana Valdés-Ramos [1,*]

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 99% CI	Year
Golan Rachel	7.3	2.8	15	7.3	2.6	12	15.9%	0.00 [-1.00, 1.00]	2012
L. Maria Belalcazar	7.9	3.1	922	3.1	3.9	836	21.9%	1.37 [1.23, 1.51]	2012
Dylan Thomson	5.79	1.7	248	5.5	1.7	99	21.3%	0.17 [-0.14, 0.48]	2014
Lasa, A.	7.9	3.1	74	3.1	3.9	67	20.2%	1.36 [0.88, 1.85]	2014
Maiorino Maria Ida	8.87	1.9	102	7.1	1.7	97	20.8%	0.98 [0.59, 1.36]	2016
Total (99% CI)			**1361**			**1111**	**100.0%**	**0.81 [0.06, 1.56]**	

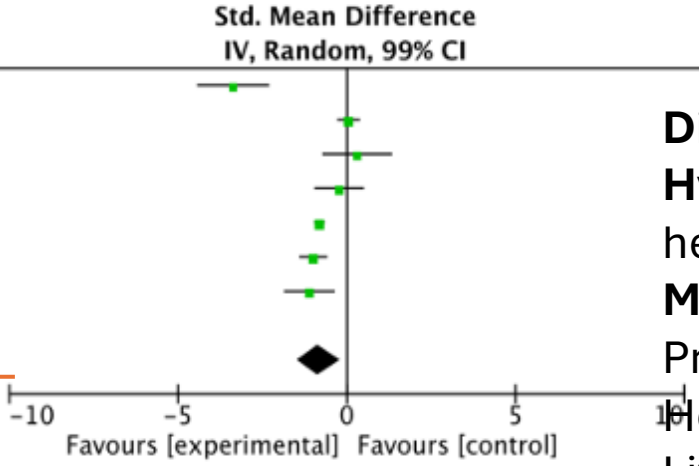
Heterogeneity: $Tau^2 = 0.38$; $Chi^2 = 96.28$, df = 4 ($P < 0.00001$); $I^2 = 96\%$
Test for overall effect: Z = 2.80 (P = 0.005)



(A) Adiponectin

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 99% CI
Azadbakht Leila	2.04	0.2	31	2.91	0.3	31	11.8%	-3.37 [-4.41, -2.33]
Dylan Thomson	1.68	3	248	1.53	3.4	99	16.1%	0.05 [-0.26, 0.35]
Golan Rachel	4.6	3.4	15	3.6	2.9	12	12.0%	0.30 [-0.70, 1.31]
Itsiopoulos C.	2.38	0.46	27	2.49	0.5	27	14.0%	-0.23 [-0.93, 0.48]
L. Maria Belalcazar	2.8	1.35	922	4.02	1.64	836	16.6%	-0.82 [-0.94, -0.69]
Maiorino Maria Ida	1.94	0.78	102	2.84	1.01	97	15.7%	-1.00 [-1.38, -0.61]
Sauder, Katherine	1.98	0.16	30	2.16	0.16	30	13.9%	-1.11 [-1.83, -0.39]
Total (99% CI)			**1375**			**1132**	**100.0%**	**-0.83 [-1.49, -0.17]**

Heterogeneity: $Tau^2 = 0.39$; $Chi^2 = 104.17$, df = 6 ($P < 0.00001$); $I^2 = 94\%$
Test for overall effect: Z = 3.26 (P = 0.001)



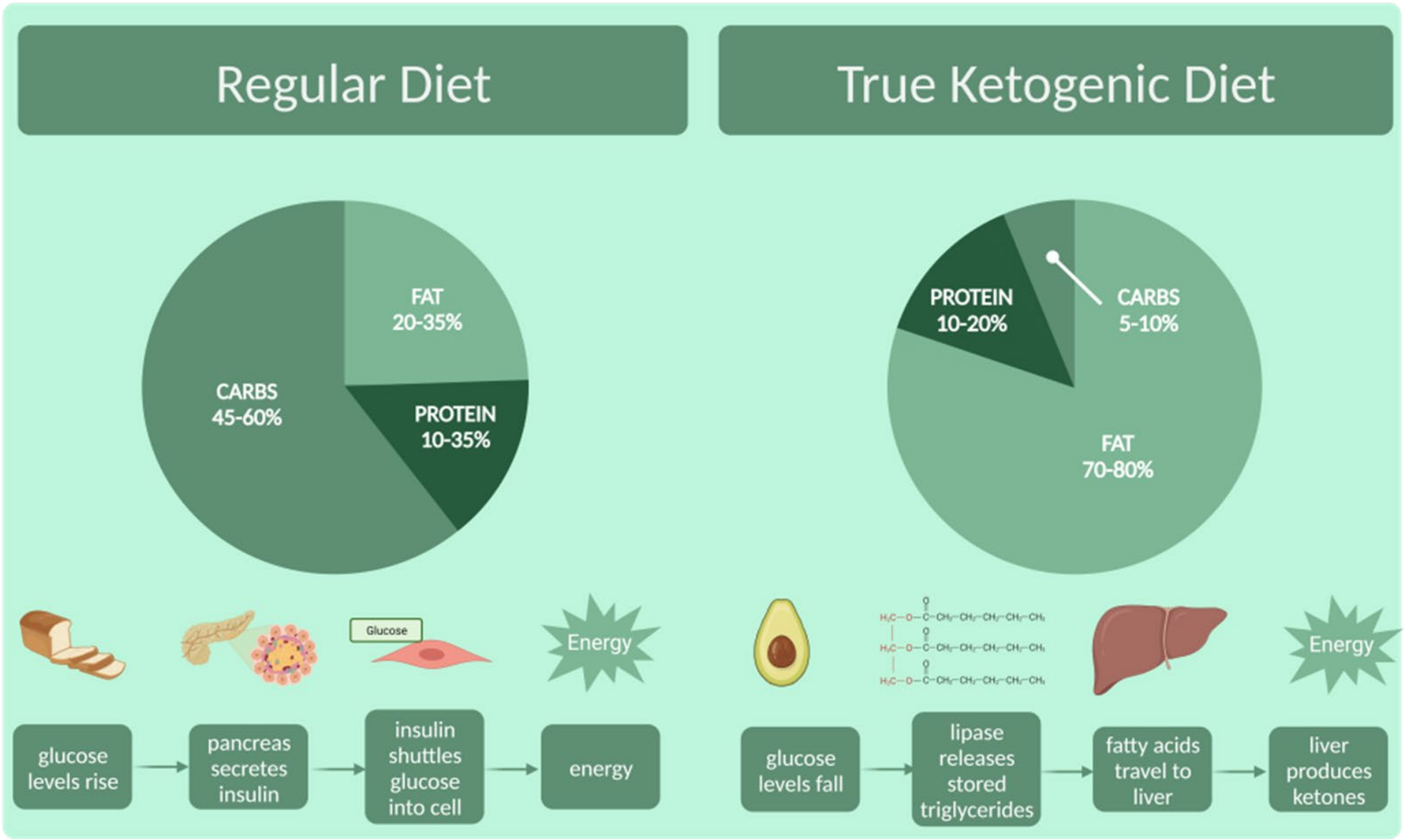
(B) CRP

SOLO PER: Mediterranean Diet, Diabetes Prevention Program, American Heart Association's Therapeutic Lifestyle Changes diet

Dietary Approaches to Stop Hypertension, Diabetes UK healthy eating guidelines, **Mediterranean Diet,** Diabetes Prevention Program, American Heart Association's Therapeutic Lifestyle Changes diet

Sánchez-Rosales, et al. *Nutrients*, 2022, *14*(21), 4577.

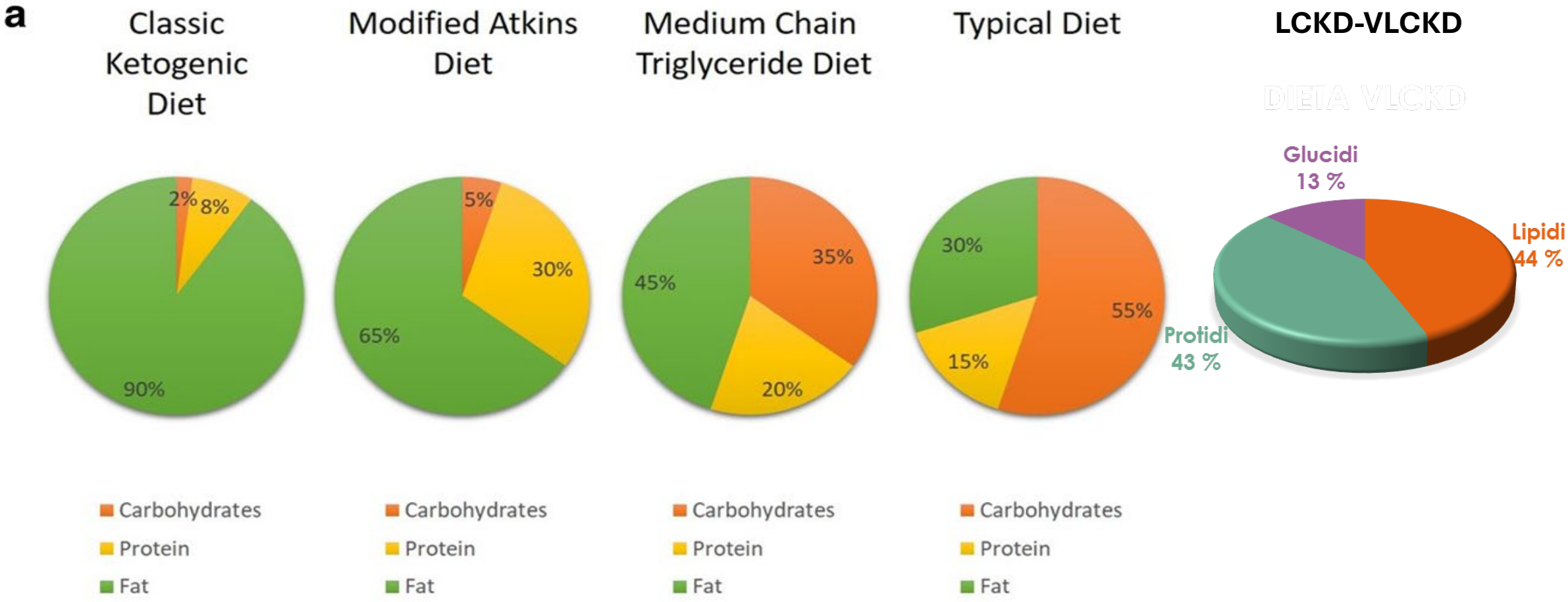
APPROCCI INNOVATIVI - KETOGENIC DIET



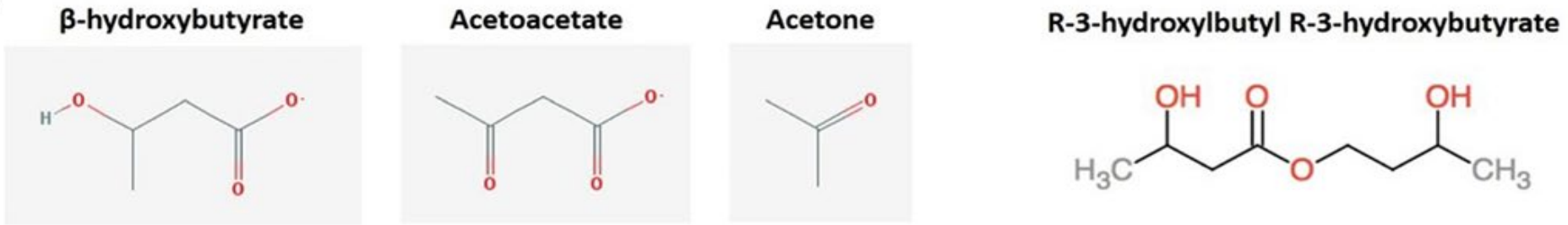
Ya'el Courtney, Neuroscience program at Harvard University. 2023

PROTOCOLLI DI DIETA CHETOGENICA

a



b



ShaabanS et al. Front.Pediatr. 2023

VARIANTI DELLA DIETA CHETOGENICA LOW-CALORIE

Table 1. Characteristics of classical ketogenic diet (KD), low-calorie ketogenic diet (LCKD) and very low-calorie ketogenic diet (VLCKD).

	KD	LCKD	VLCKD
Caloric intake	Normocaloric	800–1200 Kcal/day	<800 Kcal/day
Carbohydrate (%)	5–10	13	13
Protein (%)	15–20	29	44
Fat (%)	70–80	58	43
Foods	Vegetable oils, fish, eggs, meat, cheese, olives, avocado, coconut	Natural high biological value proteins (1–2 servings) including meat, fish, eggs, processed meat	Replacement meals with high biological value proteins composed by 18 g of proteins, 4 g of carbohydrates and 3 g of fats
Recommendations for use [1]	• Epilepsy and resistance to antiepileptic therapy • Gliomas and glioblastomas • Neurodegenerative diseases (Alzheimer or Parkinson's disease) • Neurocognitive disorders • Brain trauma	• Obesity BMI 25–35 kg/m^2 • Obesity associated with arterial hypertension or type 2 diabetes mellitus or hypertriglyceridaemia or heart failure or polycystic ovary syndrome • Paediatric obesity with epilepsy and/or insulin resistance	• Severe obesity • Obesity complicated by type 2 diabetes or arterial hypertension or hypertriglyceridaemia or metabolic syndrome or OSAS or arthropathies • Obesity with indication of bariatric surgery • Adolescents with severe obesity

Nutrients 2022,14,2388

FASI DEL PROTOCOLLO VLCKD-LCKD

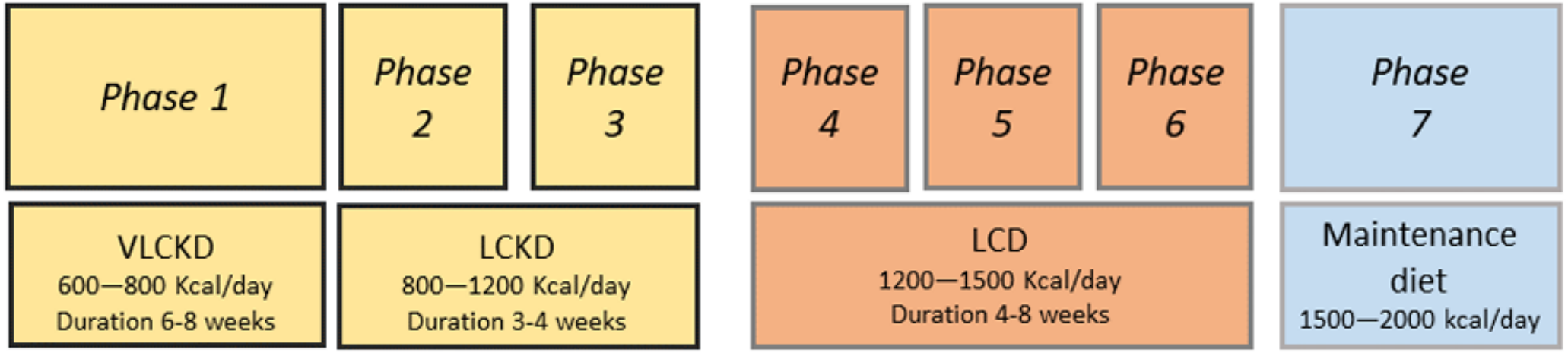
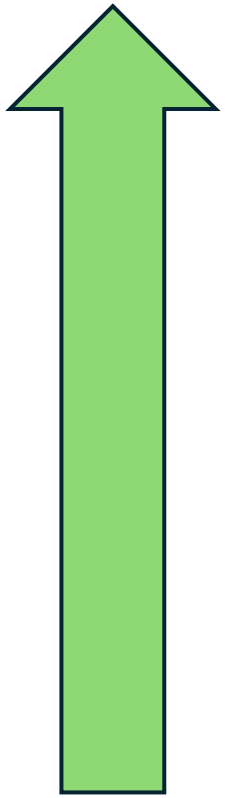


Figure 1. Phases of very low-calorie ketogenic diet (VLCKD) protocol. LCKD: low-calorie ketogenic diet. LCD: low carbohydrate diet.

Nutrients 2022,14,2388

Effetti in campo metabolico



Soppressione dell’appetito
Riduzione della lipogenesi
Aumento della lipolisi
Riduzione del grasso viscerale
Aumento dei costi metabolici della gluconeogenesi e dell’effetto termico delle proteine
Riduzione dei fattori infiammatori

DM1 e L-CarbDs

RESEARCH ARTICLE

Low-carbohydrate diets for type 1 diabetes mellitus: A systematic review

Jessica L. Turton[1], Ron Raab[2], Kieron B. Rooney[3]*

FLCD: false low-carbohydrate diet= **130g/d**;
TLCD: true low-carbohydrate diet= **50–130g/d**;
VLCKD: Very low-carbohydrate ketogenic diet = **<50g/d**

Turton, J. L., Raab, R., & Rooney, K. B. (2018). PloS one, 13(3), e0194987.

Table 2. Effect of intervention and comparator diets on type 1 diabetes management outcomes (primary and secondary).

Study ID	I/C[a]	CHO[b]	Class[c]	Follow-up[d]	Pre (units)[e]	Post (units)[e]	Significance[f]	
							Within Group	Between Groups
Haemoglobin A1c *(%HbA1c (mmol/mol))*								
Anderson 1991	I	221 ± 35 (~39%)	FLCD	4 weeks (*n* 8)	9.0 ± 0.5 (75 ± 5.5)	8.1 ± 0.4 (65 ± 4.4)	NS	NS
	C	363 ± 76 (~68%)	-	4 weeks (*n* 8)	9.0 ± 0.5 (75 ± 5.5)	8.0 ± 0.3 (64 ± 3.3)	NS	
Chantelau 1982	I	156 ± 46 (34 ± 5%)	FLCD	4–6 months (*n* 10)	9.7 ± 1.9 (83 ± 20.8)	7.3 ± 0.5 (56 ± 5.5)	$P < 0.0025$	-
Ireland 1992	I	~87 (22 ± 6%)	TLCD	2 weeks (*n* 8)	11.1 ± 1.7 (98 ± 18.6)	11.6 ± 2.3 (103 ± 25.1)	NS	-
Knight 2016	I	162 (143–204) (42 ± 7%)	FLCD	12 months (*n* 46)	7.9 ± 1.2 (63 ± 13.1)	7.9 ± 1.6 (63 ± 17.5)	NS	-
Krebs 2016	I	103 ± 22 (~30%)	TLCD	12 weeks (*n* 5)	7.9 ± 0.9 (63 ± 9.8)	7.2 ± 0.4 (55 ± 4.4)	NS	NS
	C	203 ± 92 (~44%)	-	12 weeks (*n* 5)	7.4 ± 0.9 (57 ± 9.8)	7.4 ± 0.9 (57 ± 9.8)	NS	
Nielsen 2012	I_A	≤75 (15–20%)	TLCD	4 years (*n* 48)	7.6 ± 1.0 (60 ± 10.9)	6.9 ± 1.0 (52 ± 10.9)	$P < 0.001$	-
	I_B	-	-	4 years (*n* 23)	7.7 ± 1.0 (61 ± 10.9)	6.4 ± 0.8 (46 ± 8.7)	$P < 0.001$	-
O'Neill 2003	I	30	VLCKD	18 months (*n* 8)	6.8 ± 1.1 (51 ± 12.0)	5.5 ± 0.8 (37 ± 8.7)	$P = 0.003$	-
Vernon 2003	I	20–50	VLCKD	3 months (*n* 1)	16.8 (160)	5.3 (34)	NA	-
Severe Hypoglycemia *(episodes/year)*								
Bernstein 1980	I	15%	TLCD	5 years (*n* 1)	730.0[g]	12.0	NA	-
Knight 2016	I	162 (143–204) (42 ± 7%)	FLCD	12 months (*n* 46)	3.7 ± 15.7	0.2 ± 1.1	$P = 0.014$	-
Total Daily Insulin *(units/day)*								
Bernstein 1980	I	15%	TLCD	5 years (*n* 1)	80.0	25.0	NA	-
Ireland 1992	I	~87 (22 ± 2%)	TLCD	2 weeks (*n* 8)	41.1 ± 3.5	35.3 ± 4.1	$P < 0.05$	-
Krebs 2016	I	103 ± 22 (~30%)	TLCD	12 weeks (*n* 5)	66.4 ± 25.3	44.2 ± 16.5	$P < 0.05$	$P < 0.05$
	C	203 ± 92 (~44%)	-	12 weeks (*n* 5)	40.6 ± 7.8	44.8 ± 12.4	NS	
Nielsen 2012	I	≤75 (15–20%)	TLCD	1 year (*n* 36)	42.6 ± 10.3	31.6 ± 8.5	NA	-
O'Neill 2003	I	30	VLCKD	8–61 months (*n* 10)	47.0	30.0	NA	-
Body Mass Index *(kg/m^2)*								
Krebs 2016	I	103 ± 22 (~30%)	TLCD	12 weeks (*n* 5)	27.5 ± 2.2	25.8 ± 1.0	NS	NS
	C	203 ± 92 (~44%)	-	12 weeks (*n* 5)	27.7 ± 6.2	27.6 ± 6.1	NS	
Nielsen 2012	I	≤75 (15–20%)	TLCD	4 years (*n* 48)	25.9 ± 3.5	25.7 ± 3.8	NS	-
Vernon 2003	I	20–50	VLCKD	3 months (*n* 1)	20.5	23.3	NA	-
Mean Blood Glucose *(mmol/L)*								
Krebs 2016	I	103 ± 22 (~30%)	TLCD	12 weeks (*n* 5)	10.2 ± 2.3	8.9 ± 0.8	NS	NS
	C	203 ± 92 (~44%)	-	12 weeks (*n* 5)	9.3 ± 1.9	10.1 ± 2.9	NS	

Review

Effect of the Ketogenic Diet on the Prophylaxis and Treatment of Diabetes Mellitus: A Review of the Meta-Analyses and Clinical Trials

Damian Dyńka [1], Katarzyna Kowalcze [1], Filip Ambrozkiewicz [2] and Agnieszka Paziewska [1,3,*]

KD BAMBINI DM1
EFFETTI

Table 1. Effect of ketogenic diets as prescribed for children with type 1 diabetes.

Gender and Age	Disease	Dietary Intervention	Benefits	Adverse Effects	References
Boy, 4 years	Type 1 diabetes and myoclonic-astatic epilepsy	Ketogenic diet	1. Acceptable control of epileptic seizures 2. Improvement of cognitive functions 3. Maintenance of the target glycemia values	No severe episodes of hypoglycemia or ketoacidosis were observed	[56]
Girl, 14 years	Type 1 diabetes	Ketogenic diet	1. Significant improvement of subjective sensations 2. Significant improvement in glycemia	Not observed	[57]
Girl, 3.5 years	Type 1 diabetes, right hemiparesis, epilepsy	Ketogenic diet	1. Absence of epileptic seizures 2. Improvement of development, motor functions, and activity 3. Proper glycemic control and improvement in the HbA1c value	1 episode of ketoacidosis, apart from which no adverse effects were observed	[58]
A 9-year-old child (no information on gender)	Type 1 diabetes	Paleolithic ketogenic diet	1. Improvement of insulin and glucose levels 2. Discontinuation of insulin treatment	Not observed	[59]
Girl, 2 years	Type 1 diabetes and epilepsy	Ketogenic diet	1. No episodes of epileptic seizures 2. Improvement (reduction) of glycated hemoglobin level 3. No new episodes of diabetic ketoacidosis	Mild hypoglycemia episodes	[60]
Girl, 4 years	Pyruvate dehydrogenase deficiency, diabetic ketoacidosis, static encephalopathy, convulsive disorders	Ketogenic diet	1. Proper glycemic control 2. Improvement of activity level 3. Significant developmental achievement 4. Compensation of linear growth from < 5th to the 50th percentile	No major adverse effects were observed	[9]

Dyńka, D et al. Nutrients 2023,

Review

Effect of the Ketogenic Diet on the Prophylaxis and Treatment of Diabetes Mellitus: A Review of the Meta-Analyses and Clinical Trials

Damian Dyńka [1], Katarzyna Kowalcze [1], Filip Ambrozkiewicz [2] and Agnieszka Paziewska [1,3,*]

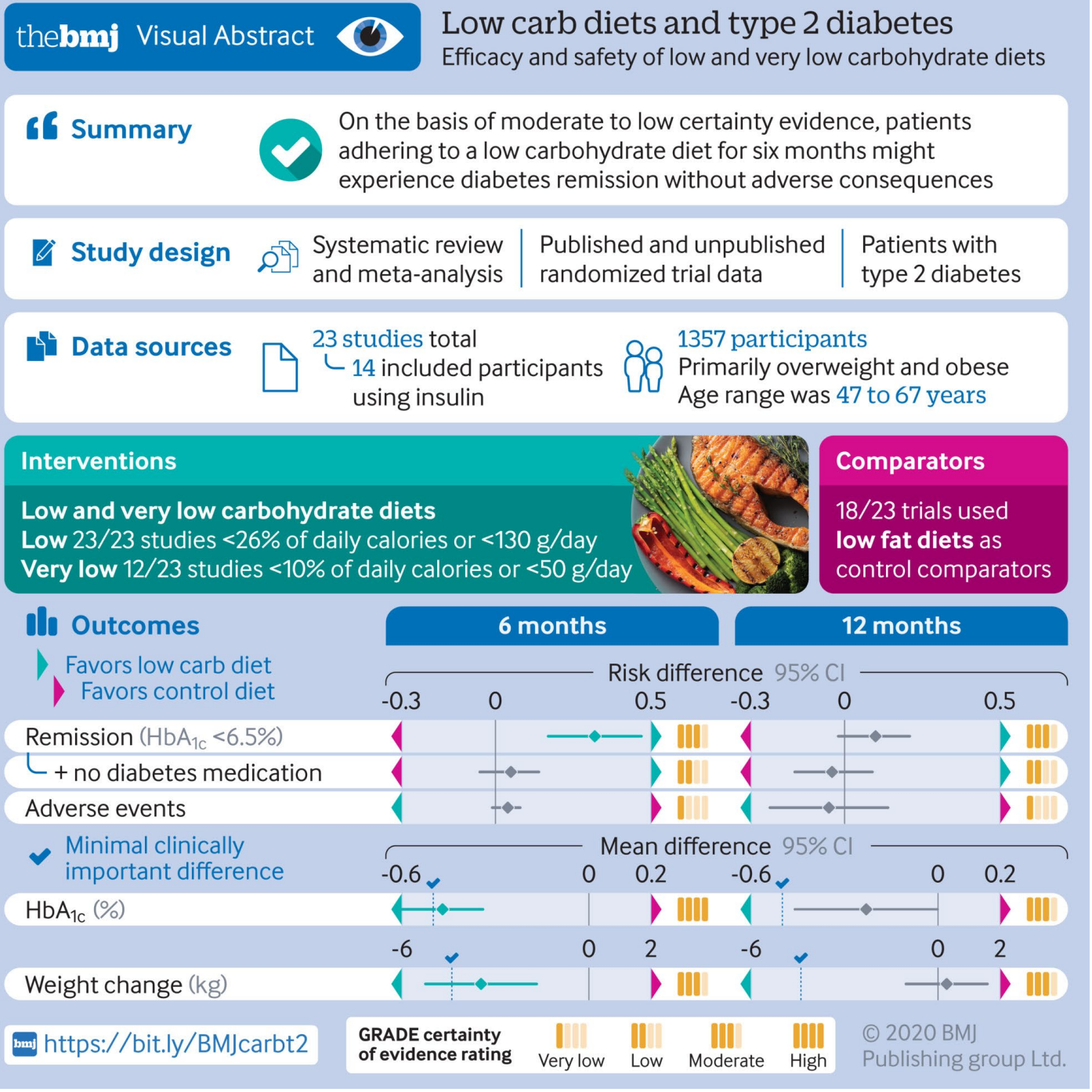
KD ADULTI DM1
EFFETTI

Table 2. Effect of a ketogenic diet in adults with type 1 diabetes.

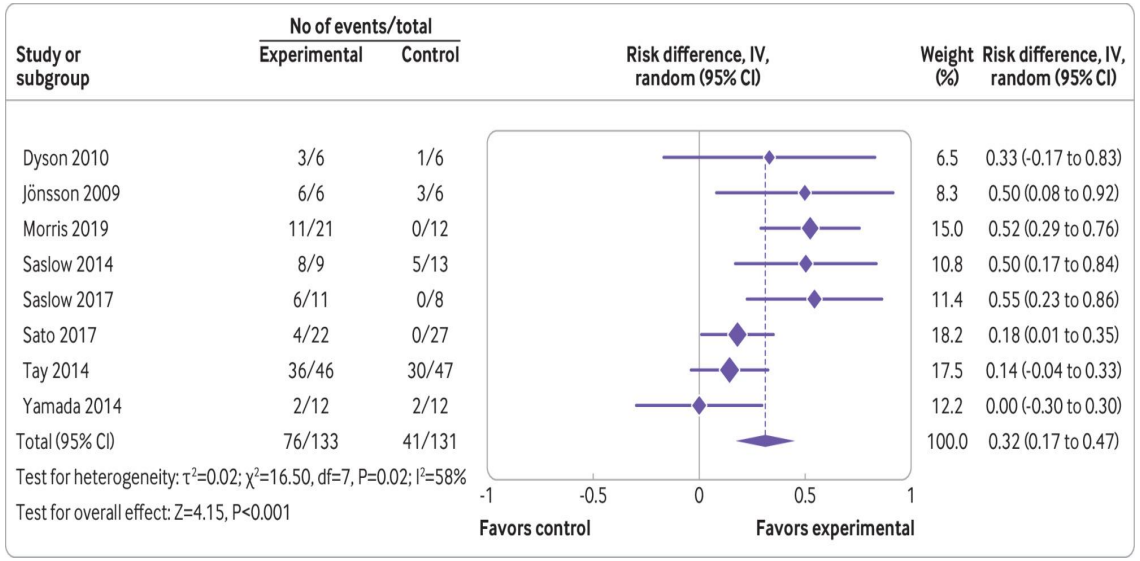
Gender and Age	Disease	Dietary Intervention	Benefits	Adverse Effects	References
Group of 17 women and 7 men. Mean age 51 ± 10 years	Type 1 diabetes	Low-carbohydrate diet (70–90 g carbohydrates)	1. Significant reduction in hypoglycemia episodes and glycated hemoglobin concentration (from 7.5% to 6.4%), 2. Significant reduction in the postprandial requirement for insulin (from 21.1 IU daily to 12.4 IU daily) 3. Reduction of triglyceride concentration by 16% on average	Diabetic gastroparesis was observed in 6 individuals	[62]
Group of 7 men and 4 women. Mean age 36.1 ± 6.8 years	Type 1 diabetes	Ketogenic diet	1. Normal HbA1c concentration (The mean HbA1c levels were 35 ± 4 mmol/mol (5.3 ± 0.4%)) 2. Slight changes in glycemia values (little daily glycemic variability (1.5 ± 0.7 mmol/L)	Hypoglycemia episodes and dyslipidemia were observed	[63]
Group of 4 men and 1 woman. Mean age 44.5 ± 10.4 years (in the normal carbohydrate amount group, there were an additional 3 men and 2 women, mean age 44.8 ± 8.3 years)	Type 1 diabetes	Target: ketogenic diet, 50–75 g carbohydrates as a result: low-carbohydrate diet, up to 100 g of carbohydrates	1. Improved glycemic control (significant reductions in HbA1c (63 to 55 mmol/mol)) 2. Reduction of insulin doses (significant reductions in daily insulin use (64.4 to 44.2 units/day)) 3. Body mass reduction (83.2 to 78.0 kg)	One participant reported a higher irritability and another one a greater number of minor diseases	[64]
Group of 316 women and men. Mean age 27 ± 19	Type 1 diabetes	Carbohydrates of 36 g on average, i.e., a ketogenic diet	1. Improved glycemic control (mean HbA1c was 5.67% ± 0.66%) 2. Lower requirement for insulin	A group of 7 individuals in a year, who reported a hospitalization associated with diabetes (including ketoacidosis and hypoglycemia); in the remaining majority of cases, there were no adverse effects	[65]

Dyńka, D et al. Nutrients 2023,

DM2 e L-CarbDs a lungo termine



Remission (HbA1c <6.5%) at six months



LCD hanno aumentato le remissioni di n. 32 ogni 100 pazienti seguiti e in terapia farmacologica, **ma si perdono già a 12 mesi**

Joshua Z Goldenberg et al. BMJ 2021;372:bmj.m4743

Article

Impact of a Ketogenic Diet on Metabolic Parameters in Patients with Obesity or Overweight and with or without Type 2 Diabetes: A Meta-Analysis of Randomized Controlled Trials

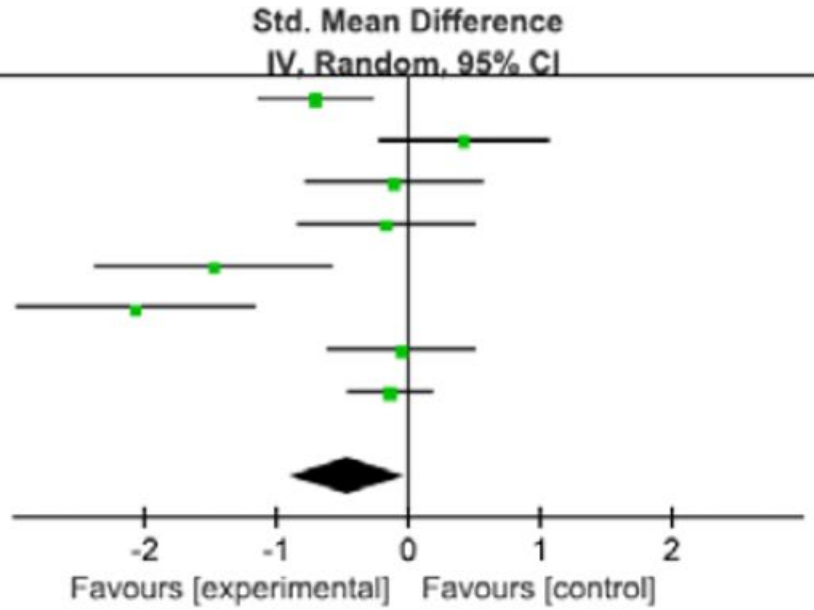
Yeo Jin Choi [1,†], Sang-Min Jeon [2,3,†] and Sooyoung Shin [2,3,*]

Soggetti sovrappeso o obesi con o senza DM2
tutta la popolazione
Cambiamento del peso corporeo

(a) Weight

Study or Subgroup	Weight	Std. Mean Difference IV, Random, 95% CI
Goday 2016	14.6%	-0.71 [-1.15, -0.27]
Partsalaki 2012	12.4%	0.42 [-0.23, 1.07]
Saslow 2014	12.2%	-0.11 [-0.78, 0.57]
Saslow 2017-1	12.1%	-0.17 [-0.85, 0.50]
Saslow 2017-2	9.9%	-1.48 [-2.38, -0.58]
Sun 2019	9.8%	-2.07 [-2.98, -1.16]
Westman 2008	13.3%	-0.05 [-0.61, 0.51]
Yancy 2010	15.6%	-0.14 [-0.46, 0.19]
Total (95% CI)	**100.0%**	**-0.46 [-0.90, -0.03]**

Heterogeneity: $Tau^2 = 0.29$; $Chi^2 = 31.20$, df = 7 ($P < 0.0001$); $I^2 = 78\%$
Test for overall effect: Z = 2.07 (P = 0.04)



Choi, Y. J., Jeon, S. M., & Shin, S. (2020). *Nutrients*, *12*(7), 2005.

Article

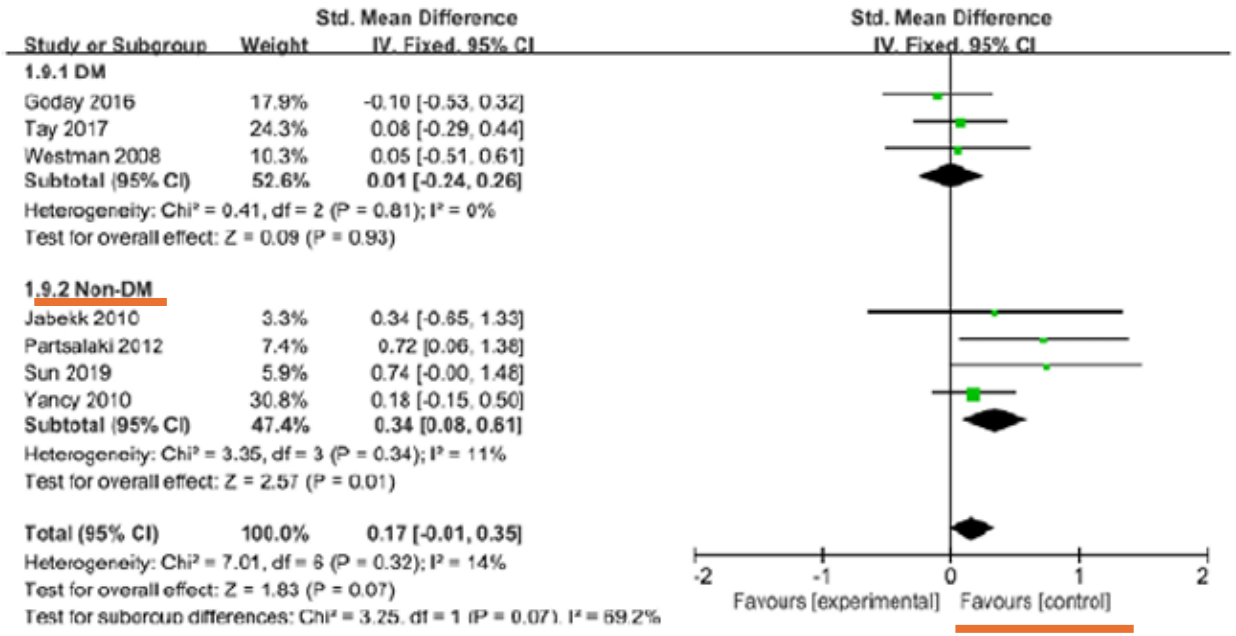
Impact of a Ketogenic Diet on Metabolic Parameters in Patients with Obesity or Overweight and with or without Type 2 Diabetes: A Meta-Analysis of Randomized Controlled Trials

Yeo Jin Choi [1,†], Sang-Min Jeon [2,3,†] and Sooyoung Shin [2,3,*]

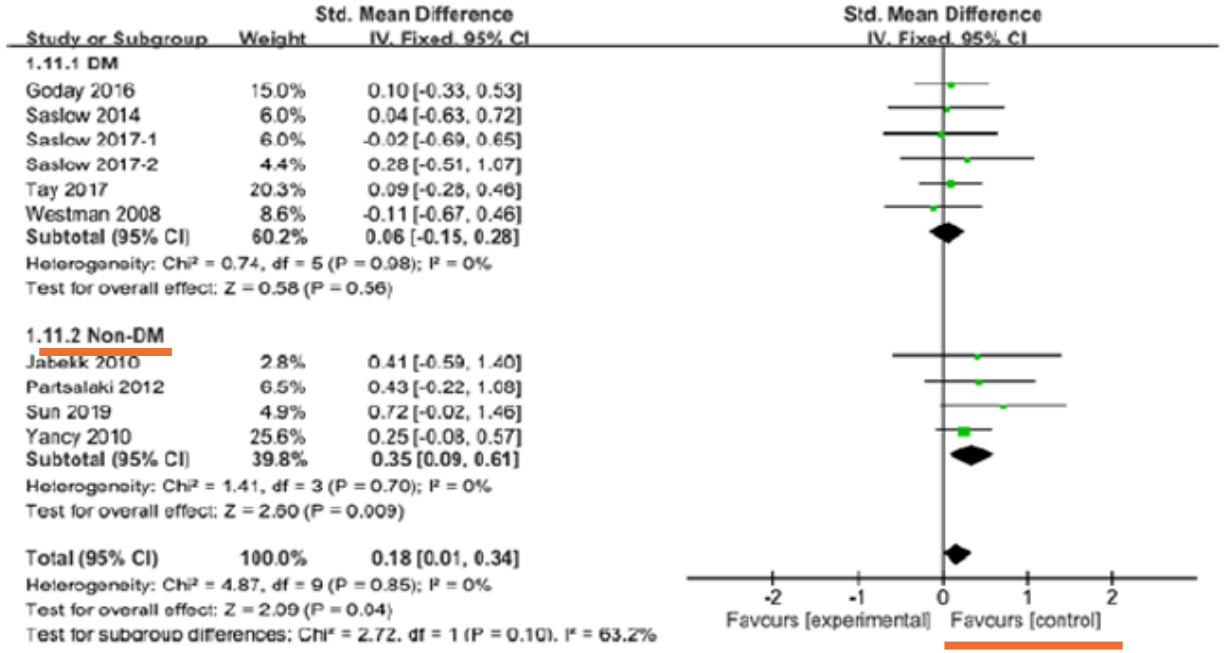
Soggetti sovrappeso o obesi con o senza DM2

Effetti sfavorevoli negli Ob Non-DM della KD su T-Col e LDL-Col

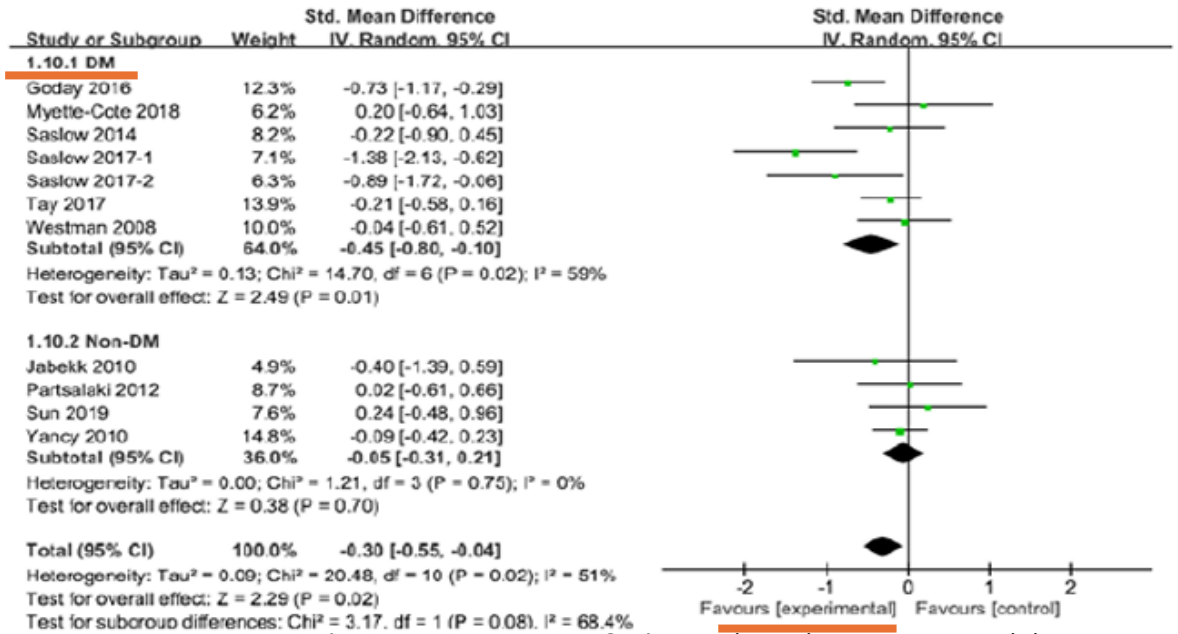
(a) Total cholesterol



(c) LDL

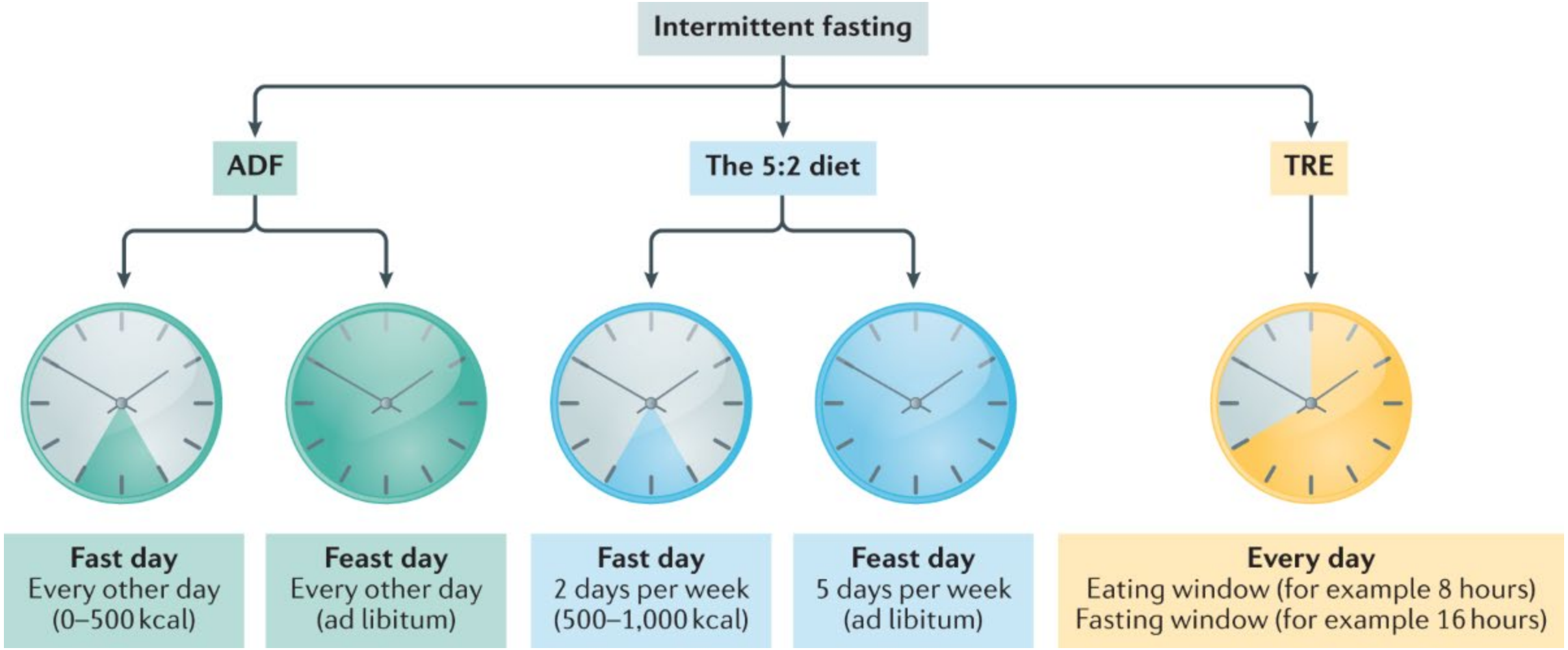


(b) Triglyceride



Choi, Y. J., Jeon, S. M., & Shin, S. (2020). *Nutrients*, *12*(7), 2005.

INTERMITTENT FASTING

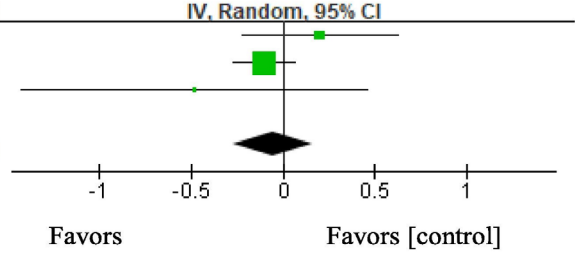


Varady, K.A*Nat Rev Endocrinol* **18**, 309–321 (2022)

1. HbA1c

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Carter 2018	-0.3	0.8	70	-0.5	1.6	67	21.3%	0.20 [-0.23, 0.63]
Sundfør 2018	-0.3	0.5	54	-0.2	0.4	58	73.7%	-0.10 [-0.27, 0.07]
Williams 1998	-0.71	1.59	16	-0.23	1.04	15	5.0%	-0.48 [-1.42, 0.46]
Total (95% CI)			**140**			**140**	**100.0%**	**-0.06 [-0.27, 0.16]**

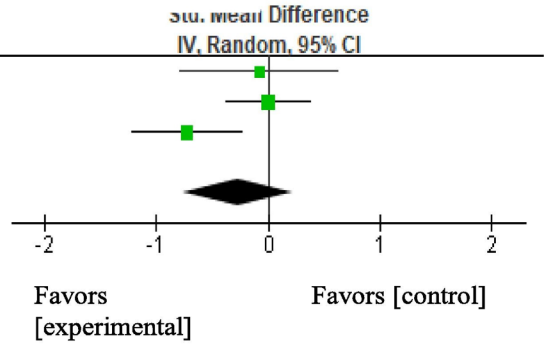
Heterogeneity: Tau² = 0.01; Chi² = 2.39, df = 2 (P = 0.30); I² = 16%
Test for overall effect: Z = 0.50 (P = 0.62)



2. Fasting glucose

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI	Year
Williams 1998	-1.9	1.5	16	-1.8	0.9	15	25.1%	-0.08 [-0.78, 0.63]	1998
Sundfør 2018	-0.2	0.9	54	-0.2	0.6	58	40.4%	0.00 [-0.37, 0.37]	2018
Parvaresh 2019	-5	6.82	35	0	6.85	34	34.5%	-0.72 [-1.21, -0.24]	2019
Total (95% CI)			**105**			**107**	**100.0%**	**-0.27 [-0.76, 0.22]**	

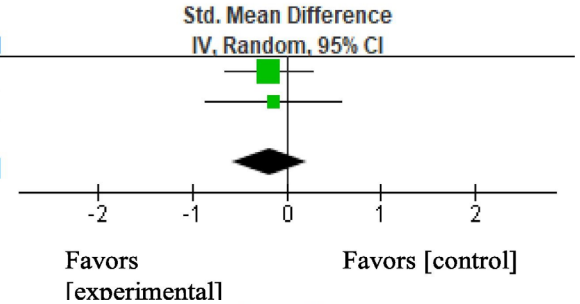
Heterogeneity: Tau² = 0.12; Chi² = 5.58, df = 2 (P = 0.06); I² = 64%
Test for overall effect: Z = 1.08 (P = 0.28)



3. Fasting insulin

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Parvaresh 2019	-2.41	3.21	35	-1.56	5.41	34	69.7%	-0.19 [-0.66, 0.28]
Williams 1998	-39	47	16	-33	36	14	30.3%	-0.14 [-0.86, 0.58]
Total (95% CI)			**51**			**48**	**100.0%**	**-0.17 [-0.57, 0.22]**

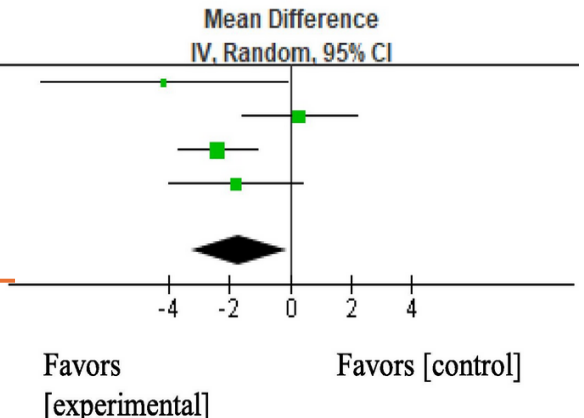
Heterogeneity: Tau² = 0.00; Chi² = 0.01, df = 1 (P = 0.91); I² = 0%
Test for overall effect: Z = 0.86 (P = 0.39)



1. Weight

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Williams 1998	-9.6	5.7	16	-5.4	5.9	15	11.4%	-4.20 [-8.29, -0.11]
Sundfør 2018	-9.1	5	54	-9.4	5.3	58	28.1%	0.30 [-1.61, 2.21]
Parvaresh 2019	-4.1	3.65	35	-1.7	1.49	34	35.8%	-2.40 [-3.71, -1.09]
Carter 2018	-6.8	6.7	70	-5	6.5	67	24.7%	-1.80 [-4.01, 0.41]
Total (95% CI)			**175**			**174**	**100.0%**	**-1.70 [-3.28, -0.11]**

Heterogeneity: Tau² = 1.38; Chi² = 6.76, df = 3 (P = 0.08); I² = 56%
Test for overall effect: Z = 2.10 (P = 0.04)



Review

Intermittent fasting versus continuous energy-restricted diet for patients with type 2 diabetes mellitus and metabolic syndrome for glycemic control: A systematic review and meta-analysis of randomized controlled trials

Xue Wang [a], *Qifei Li* [a], *Yan Liu* [a], *Hua Jiang* [b,c,d], *Wei Chen* [a,*]

DIGIUNO INTERMITTENTE vs Restrizione calorica continua

Trials clinici: 355 pazienti

Gruppo IF -1,7 kg

diabetesresearchandclinicalpractice179(2021)

KD e IF su HBA1c

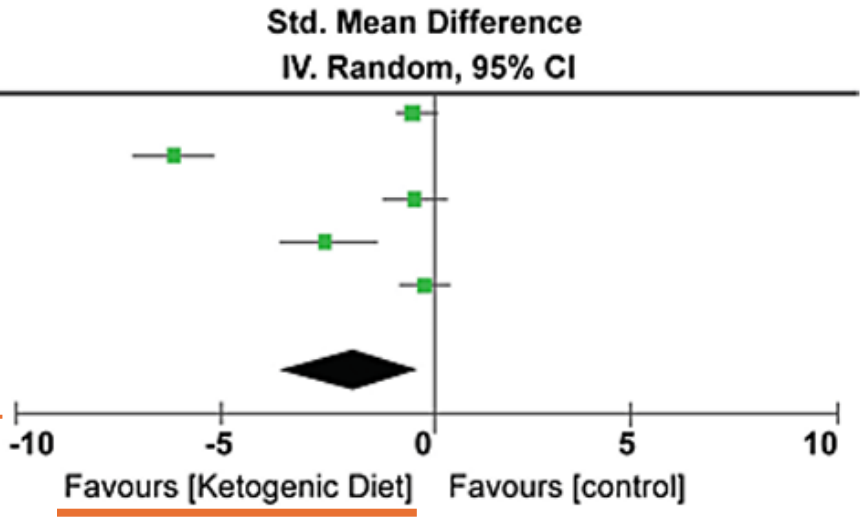
Review began 10/25/2022
Review ended 10/27/2022
Published 10/30/2022

Clinical Assessment of Intermittent Fasting With Ketogenic Diet in Glycemic Control and Weight Reduction in Patients With Type II Diabetes Mellitus: A Systematic Review and Meta-Analysis

Hany A. Zaki [1], Haris Iftikhar [1], Abeer Abdalrubb [2], Nood Dhafi R. Al-Marri [1], Mohammed Gafar Abdelrahim [1], Mohamed Fayed [1], Mohamed Abdelgadir M. Elgassim [1], Mohamed A. Elarref [3, 4]

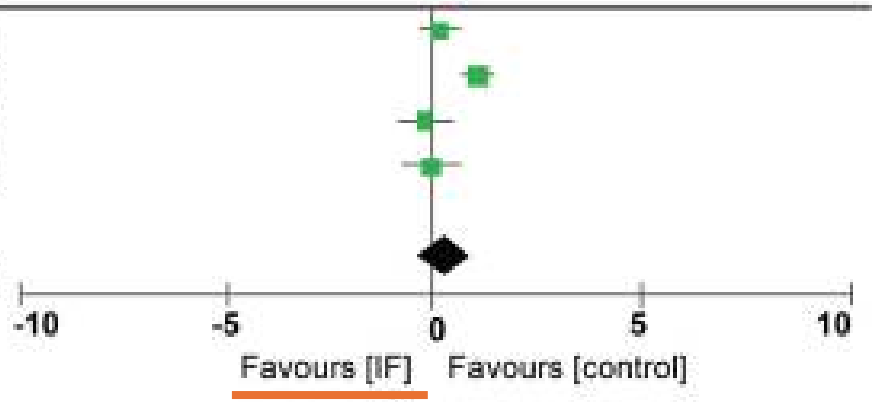
Study or Subgroup	Ketogenic Diet Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV. Random, 95% CI
Goday et al. 2016 [20]	6	0.7	45	6.4	0.8	40	20.6%	-0.53 [-0.96, -0.10]
Hussain et al. 2012 [19]	6.25	0.1	78	7.2	0.25	24	19.6%	-6.35 [-7.34, -5.35]
Moriconi et al. 2021 [21]	6.2	0.66	15	6.5	0.55	15	20.2%	-0.48 [-1.21, 0.25]
Saslow et al. 2017 [23]	6.3	0.28	12	6.9	0.15	13	19.3%	-2.61 [-3.73, -1.50]
Westman et al. 2008 [18]	7.3	1.5	21	7.8	2.1	29	20.4%	-0.26 [-0.83, 0.30]
Total (95% CI)			**171**			**121**	**100.0%**	**-2.00 [-3.76, -0.25]**

Heterogeneity. Tau² = 3.85; Chi² = 130.89, df = 4(P < 0.00001); I² = 97%
Test for overall effect Z = 2.24 (P = 0.03)



Study or Subgroup	Intermittent Fasting Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV. Random, 95% CI
Carter et al. 2016 [14]	-0.6	0.8	31	-0.8	1	32	25.8%	0.22 [-0.28, 0.71]
Carter et al. 2018 [16]	-0.3	0.1	70	-0.5	0.2	67	27.2%	1.27 [0.90, 1.63]
Corley et al. 2018 [17]	-0.7	0.1	19	-0.6	0.9	18	23.8%	-0.15 [-0.80, 0.49]
Li et al. 2017 [13]	-0.2	1.1	16	-0.2	0.8	16	23.2%	0.00 [-0.69, 0.69]
Total (95% CI)			**136**			**133**	**100.0%**	**0.36 [-0.37, 1.10]**

Heterogeneity. Tau² = 0.48; Chi² = 23.00, df = 3 (P < 0.0001); I² = 87%
Test for overall effect Z = 0.97 (P = 0.33)



AGONISTI DEL GLP-1 E DIETA

Table 2
Mean changes in weight, body composition, glycaemic measures and total energy intake in each group.

	SEM	VLCD	COMB
Weight (kg)	−6.0 ± 0.7	−13.1 ± 1.9$^{\#\#}$	−13.5 ± 1.7$^{\#\#}$
Weight (%)	−5.9 ± 0.6	−11.3 ± 1.8$^{\#}$	−12.9 ± 1.4$^{\#\#}$
BMI (kg.m^{-2})	−2.0 ± 0.2	−4.3 ± 0.7$^{\#}$	−4.7 ± 0.5$^{\#\#}$
FM (kg)	−4.0 ± 0.5	−9.0 ± 1.3$^{\#\#}$	−9.0 ± 1.2$^{\#\#}$
LBM (kg)	−1.7 ± 0.6	−3.8 ± 0.8	−3.3 ± 1.0
HbA1c (mmol/mol)	−9.7 ± 3.1	−14.9 ± 3.6	−20.9 ± 3.9
Fasting glucose (mmol/l)	−2.3 ± 0.6	−1.6 ± 0.5	−3.2 ± 0.8
Total energy intake (kcal)	−480.0 ± 223.9	−1146.6 ± 131.7$^{\#}$	−1136.5 ± 173.5$^{\#}$

Data presented as mean ± SEM. Statistical significance assessed using one-way ANOVA. #p < 0.05 v SEM, ##p < 0.01 v SEM.

Anyiam, O. et al. (2024). *Clinical nutrition*

AGONISTI DEL GLP-1 E DIETA

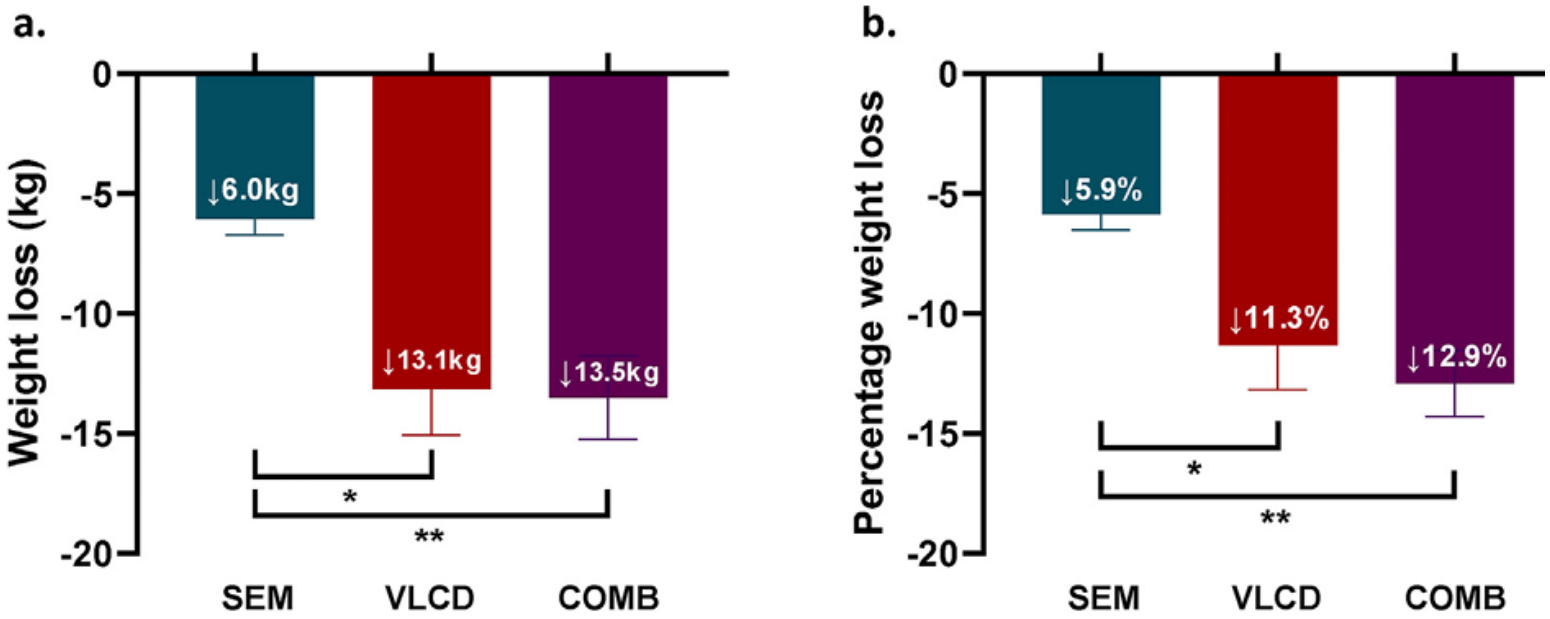


Fig. 1. Absolute weight loss (a) and percentage weight loss (b) in each group. *p < 0.05, **p < 0.01.

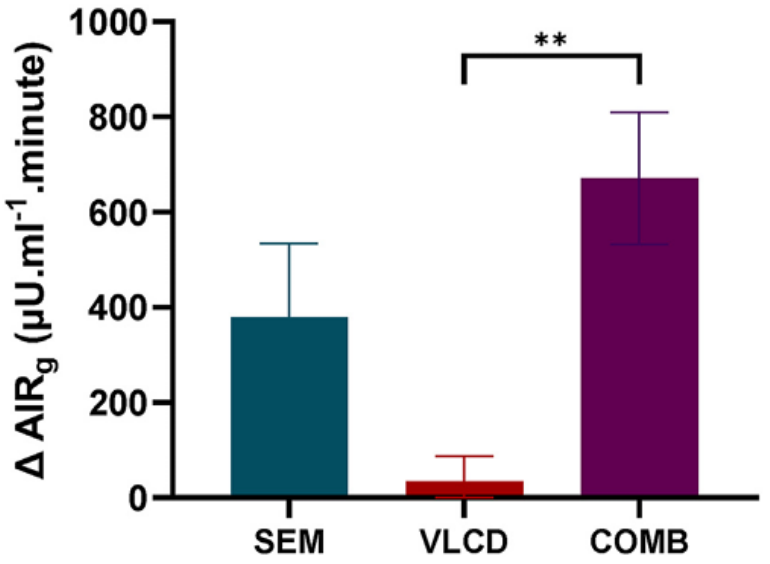


Fig. 2. Mean change in first-phase response in each group. **p < 0.01.

AIRg =Acute Insulin Response to Glucose

Anyiam, O. et al. (2024). *Clinical nutrition*

CRONONUTRIZIONE NEL DIABETE

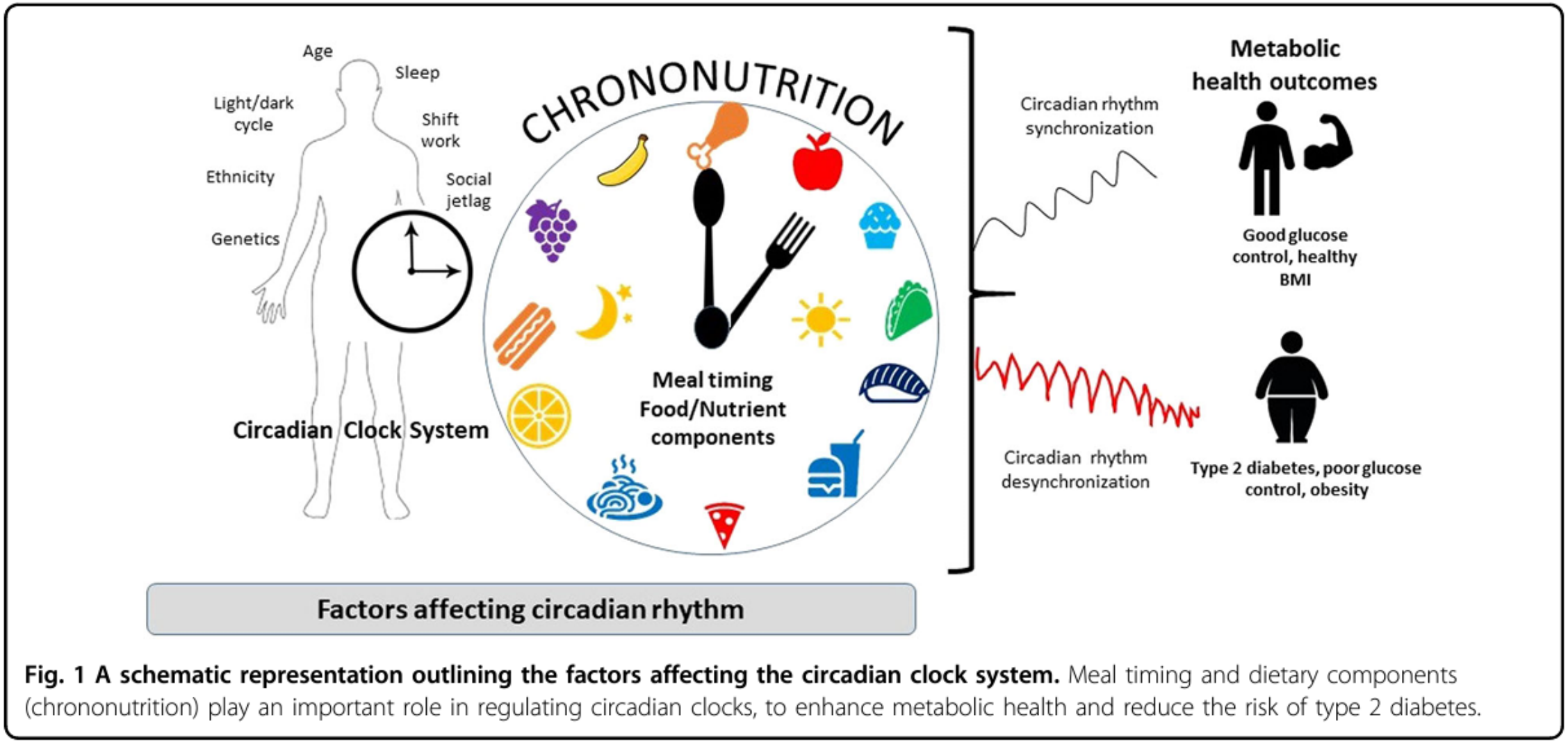


Fig. 1 A schematic representation outlining the factors affecting the circadian clock system. Meal timing and dietary components (chrononutrition) play an important role in regulating circadian clocks, to enhance metabolic health and reduce the risk of type 2 diabetes.

Henry et al. Nutrition and Diabetes (2020) 10:6

CRONONUTRIZIONE NEL DIABETE

Impatto del timing dei pasti sul DM2

Effetti del consumo di carboidrati di sera

Aumento della glicemia postprandiale rispetto a un pasto identico consumato al mattino

Modifica composizione dei macronutrienti

Aumentare le proteine e i grassi nei pasti serali, può aiutare a migliorare la risposta glicemica

Morris, C. J., Yang, J. N., & Scheer, F. A. J. L. (2012); Henry et al. Nutrition and Diabetes (2020) 10:6, Kahleova, H., Lloren, J. I., Mashchak, A., Hill, M., & Fraser, G. E. (2017); Sato, M., Nakamura, K., Ogata, H., et al. (2019). Journal of Diabetes Investigation; Jakubowicz, D., Barnea, M., Wainstein, J., & Froy, O. (2013). Obesity.

CRONONUTRIZIONE NEL DIABETE

Impatto del timing dei pasti sul DM2

Incoraggiare i pasti all'inizio della giornata

Migliore controllo glicemico

Effetto dei cibi a basso IG di mattina

Risposta glicemica più efficace rispetto al consumo serale

Jovanovic, A., Gerrard, J., Taylor, R. (2009). *Diabetes Care*, 32(7), 1199-1201. Henry et al. Nutrition and Diabetes (2020) 10:6; Sacks, F. M., Carey, V. J., Anderson, C. A., et al. (2009). JAMA, 312(23), 2531-2541; Shukla, A. P., Iliescu, R. G., Thomas, C. E., & Aronne, L. J. (2015). *Diabetes Care*, 38(7), e98-e99.

CRONONUTRIZIONE NEL DIABETE

Impatto del timing dei pasti sul DM2

Timing del consumo di grassi e proteine con carboidrati

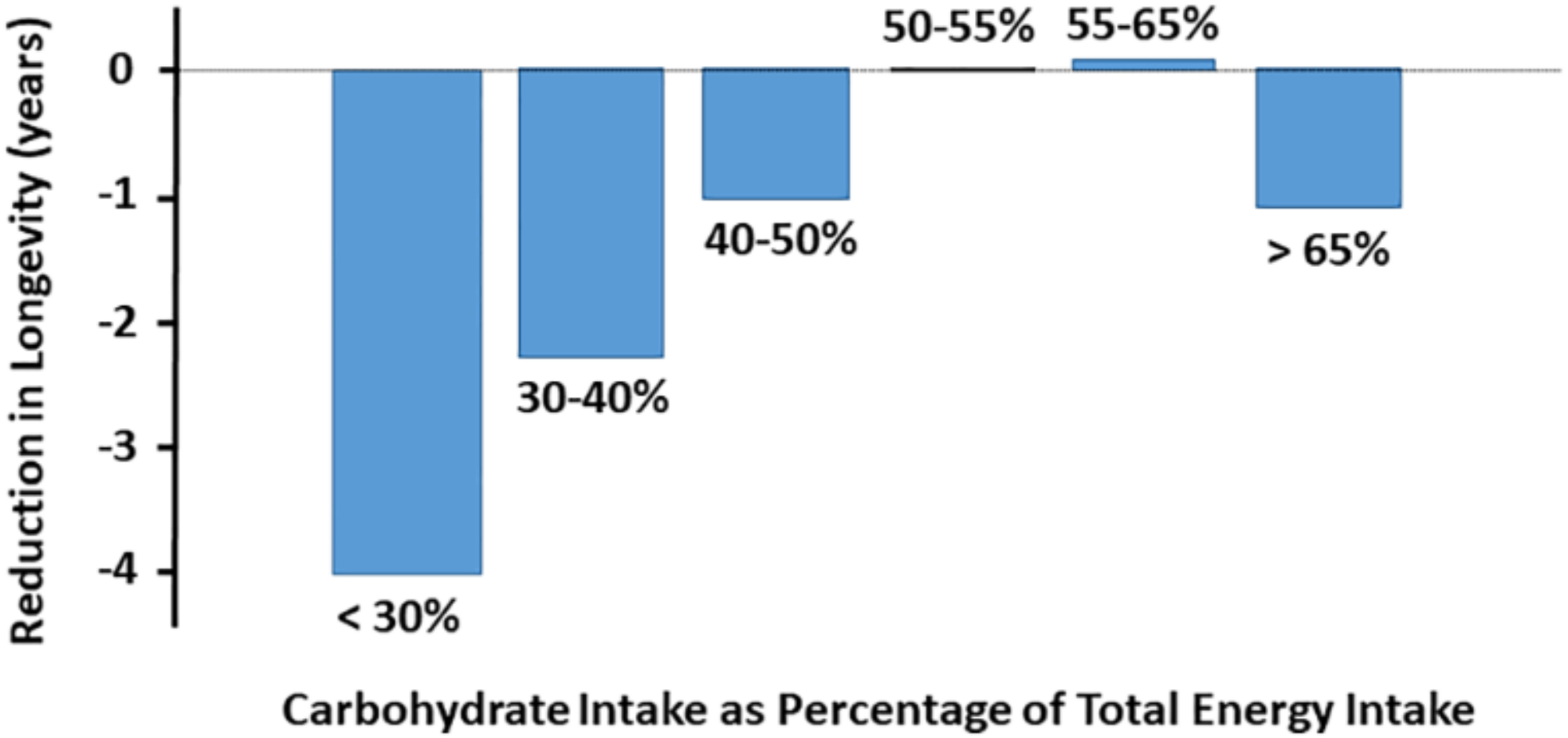
grassi e proteine (inclusi amminoacidi) insieme ai carboidrati, può ridurre la risposta glicemica

Ordine di presentazione degli alimenti sulla glicemia

mangiare prima le verdure, poi la carne e infine il riso può ridurre la glicemia postprandiale

Shukla, A. P., Iliescu, R. G., Thomas, C. E., & Aronne, L. J. (2015). Diabetes Care, 38(7), e98-e99; Mishra, S., & Stettler, N. (2005). *Journal of Clinical Biochemistry and Nutrition*, 37(2), 136-141. doi:10.3164/jcbn.37.136. Lee, Y., Bian, H., & Kim, D. (2014). Clinical Nutrition Research, 3(2), 101-107. Jakubowicz, D., Wainstein, J., Ahren, B., et al. (2015). Diabetes Care, 38(10), 1820-1826. Henry et al. Nutrition and Diabetes (2020) 10:6

INFINE.....CARBOIDRATI E LONGEVITA'



Obesity Reviews, Volume: 22, Issue: S2, First published: 20 January 2021, DOI: (10.1111/obr.13195)

*Take home message

Diete Antinfiammatorie: Migliorano controllo glicemico e riducono rischio cardiovascolare.

Dieta Chetogenica:
DM 1: Supporta stabilità glicemica (monitoraggio necessario per chetosi) ma effetti negativi, non sufficientemente supportata dagli studi;
DM 2: Favorisce perdita di peso e sensibilità insulinica, ma effetti negativi su CVC.

Digiuno Intermittente: Promettente per sensibilità insulinica e riduzione di farmaci, riduce il peso (richiede ulteriori studi).

*Take home message

Conteggio dei Carboidrati: Strategia ottimale per il DM1 per gestione precisa del glucosio e insulina.

Carboidrati e Longevità: Consumo 50-65% En carboidrati di alta qualità migliora longevità e salute metabolica.

*Take home message

- **Personalizzazione:** Adattare le strategie nutrizionali alle caratteristiche individuali (tipo di diabete, profilo metabolico, preferenze, genere) per massimizzare l'efficacia

- **Educazione e Adesione:** Promuovere un'educazione nutrizionale continua per migliorare l'adesione e mantenere risultati duraturi.

- **Ricerca e Innovazione**: Ampliare la ricerca per validare l'efficacia a lungo termine degli interventi nutrizionali innovativi e sviluppare linee guida basate sull'evidenza.

Grazie per l'attenzione!!