

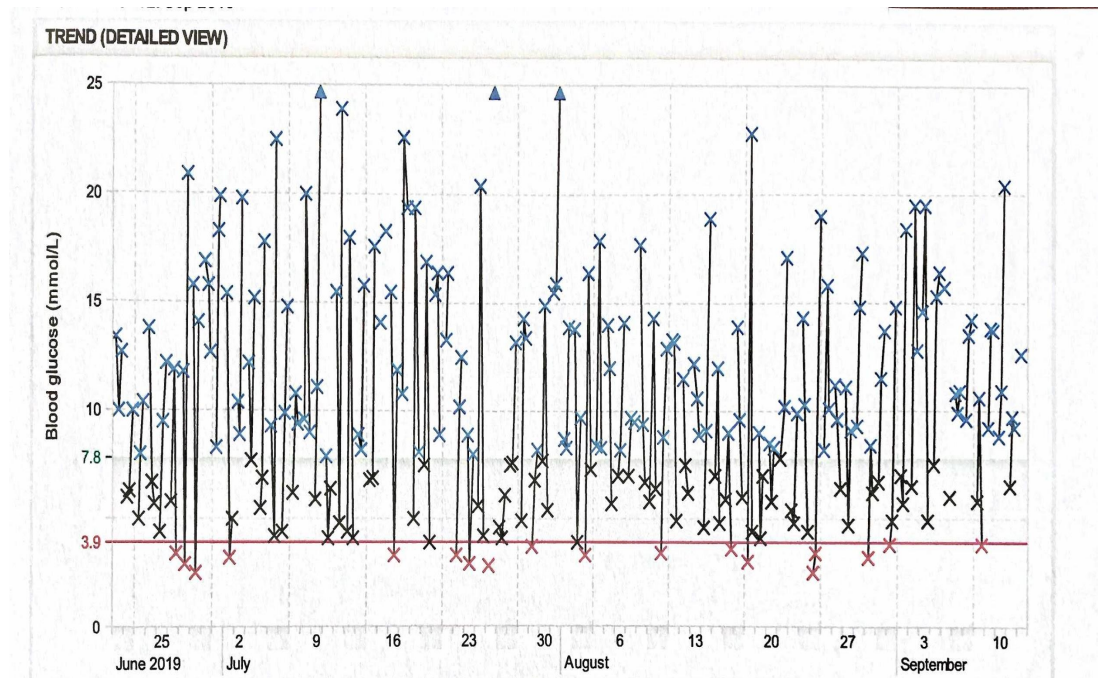
Low Carbohydrate Diets and Type 1 diabetes

Dr Neville Wellington

Nutrition Network

The problem of type 1 diabetes

- Type 1 diabetes patients struggle to control their glucose levels
- Only 20% of all type 1 patients actually achieve the ADA goals of <math><7.5\%</math>
- The Type 1 Exchange Clinic registry has shown that control for type 1 diabetes patients has actually worsened over the past 6-7 years, despite supposed advancements in medication and care. (1)



1. Foster NC, Beck RW, Miller KM, Clements MA, Rickels MR, DiMeglio LA, et al. State of Type 1 Diabetes Management and Outcomes from the T1D Exchange in 2016-2018. Diabetes technology & therapeutics. 2019;21(2):66-72.

As Hba1c levels increase, so do and CVD events and mortality increase. (2)

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

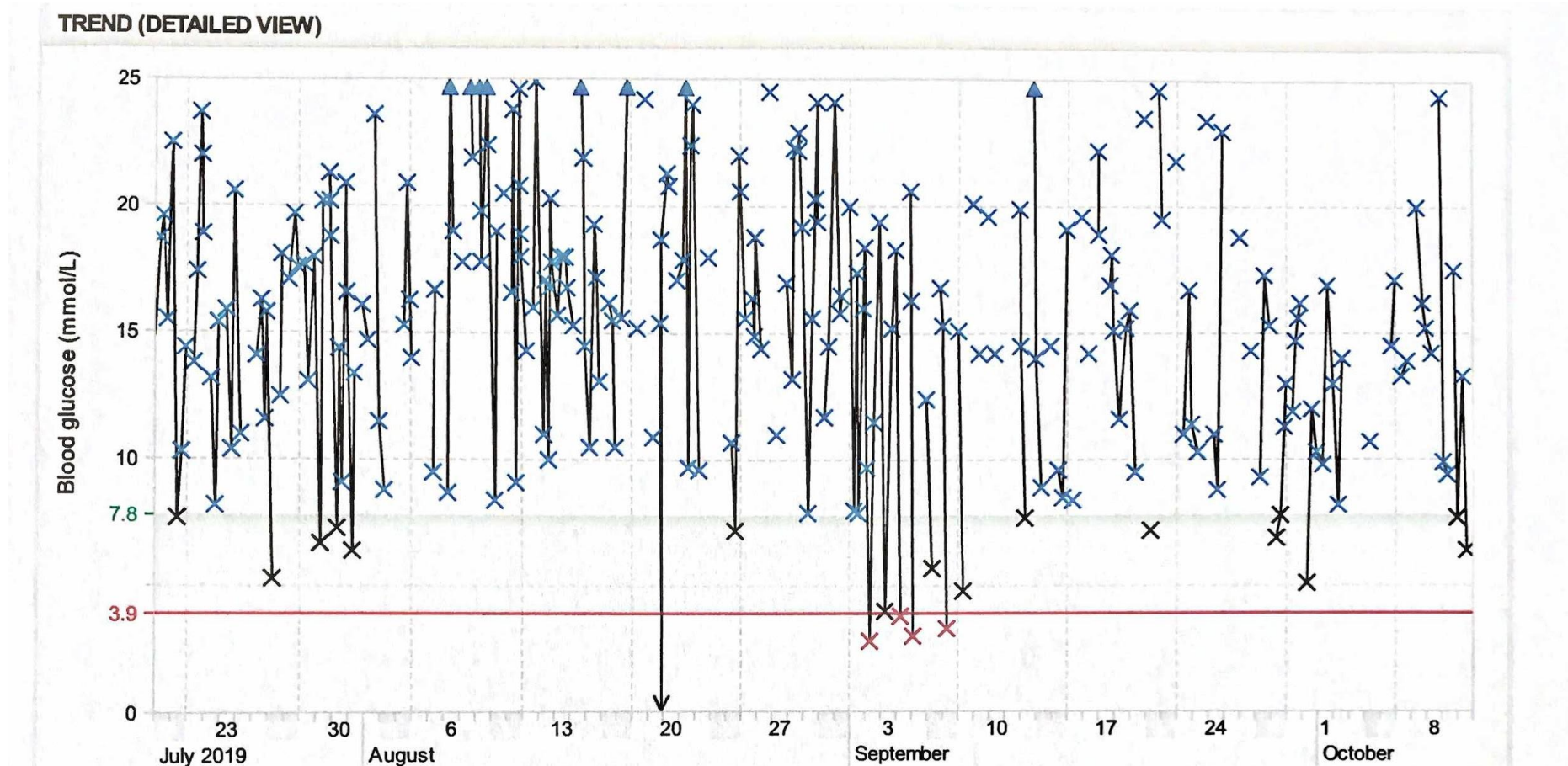
Glycemic Control and Excess Mortality in Type 1 Diabetes

Marcus Lind, M.D., Ph.D., Ann-Marie Svensson, Ph.D., Mikhail Kosiborod, M.D., Soffia Gudbjörnsdottir, M.D., Ph.D., Aldina Pivodic, M.Sc., Hans Wedel, Ph.D., Sofia Dahlqvist, Mark Clements, M.D., Ph.D., and Annika Rosengren, M.D., Ph.D.

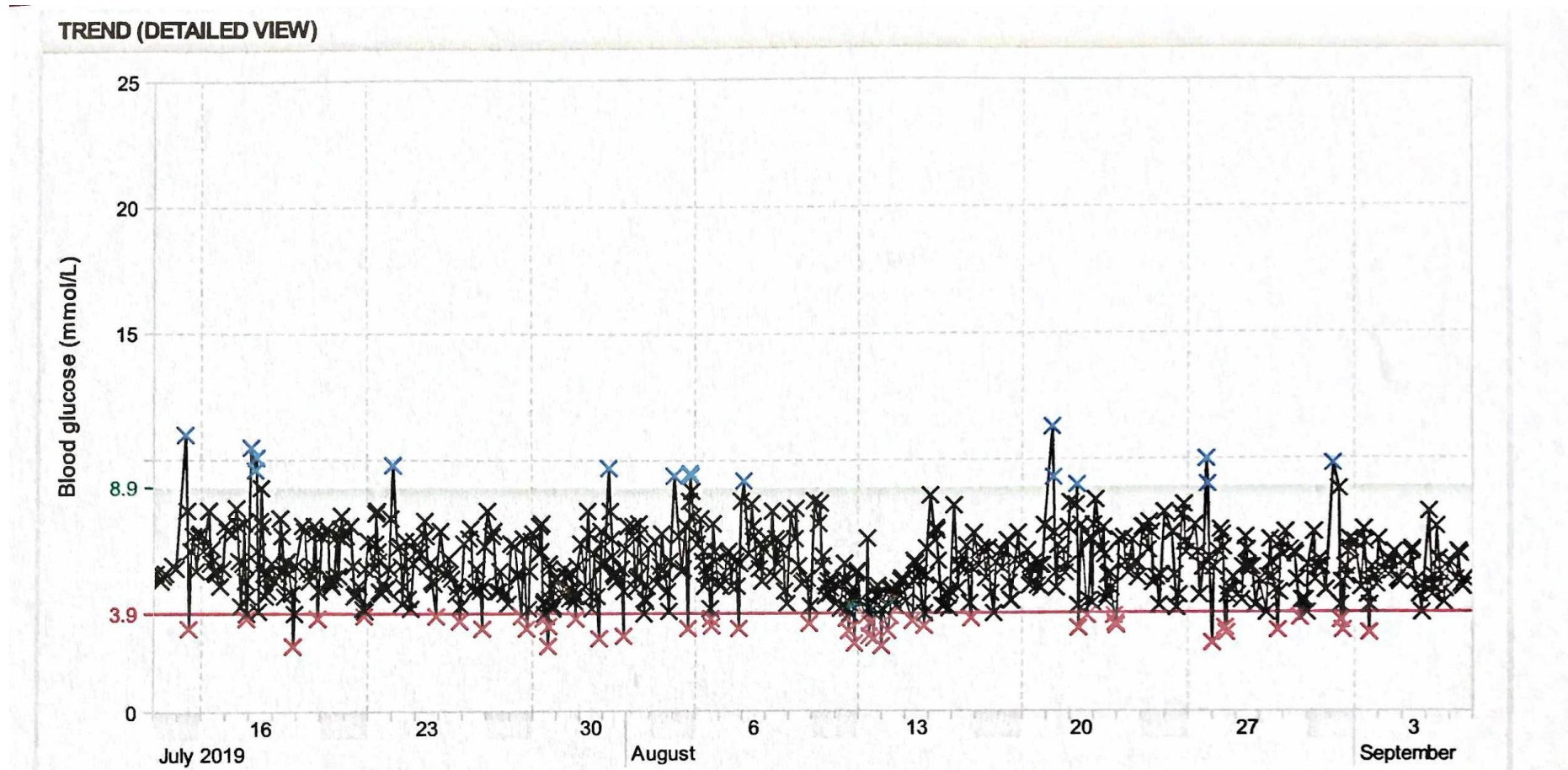
Table 3. Adjusted Hazard Ratios for Death from Any Cause and Death from Cardiovascular Causes among Patients with Type 1 Diabetes versus Controls, According to Time-Updated Mean Glycated Hemoglobin Level and Renal Disease Status, Model 3.*

Variable	Hazard Ratio	
	Death from Any Cause 7386/200,539	Death from Cardiovascular Disease 2326/200,539
Time-updated mean glycated hemoglobin level — no. of events/total no.		
Reference group (controls)	1.00	1.00
≤6.9%	2.36 (1.97–2.83)	2.92 (2.07–4.13)
7.0–7.8%	2.38 (2.02–2.80)	3.39 (2.49–4.61)
7.9–8.7%	3.11 (2.66–3.62)	4.44 (3.32–5.96)
8.8–9.6%	3.65 (3.11–4.30)	5.35 (3.94–7.26)
≥9.7%	8.51 (7.24–10.01)	10.46 (7.62–14.37)

Type 1 diabetes patient with poor control

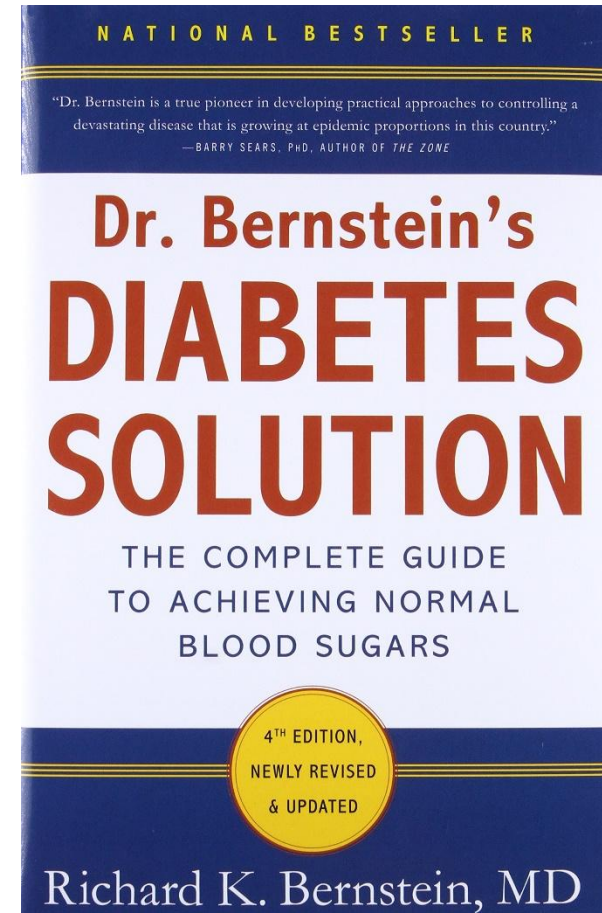


Improved control



Low Carbohydrate Diets in type 1 diabetes

- We look for research done in patients with type 1 diabetes who have used LCD.
- Much of the success in this sphere is attributed to Dr Richard Bernstein. His methods are referred to by many patients and in research articles



Research of type 1 diabetes and LCD

- Case reports
- Clinical trials
- Review articles
- Some personal experience with patients

Case reports

Case reports date back to early 2000 of patients who have used LCD's as part of therapy

The low carbohydrate/low insulin regimen – personal experience in type 1 diabetes

Ron Raab

Summary

In this article, I describe my before and after experience in adopting a low carbohydrate/low insulin/moderate protein/appropriate fat approach to the management of my type 1 diabetes. The Diabetes Centre in New York specialises in this approach and this article is based on what I learnt there and have applied since June 1998. I outline the rationale for and advantages of this approach and the contradictions inherent in the high carbohydrate/high insulin approach. These are my personal views and do not represent the position of organisations with which I work. Copyright © 2003 Ron Raab.

Case Report

Glycaemic stability of a cyclist with Type 1 diabetes: 4011 km in 20 days on a ketogenic diet

J. Nolan¹, A. Rush² and J. Kaye¹

¹Department of Endocrinology and Diabetes, Sir Charles Gairdner Hospital, Nedlands and ²Type 1 Diabetes Family Centre, Osborne Park, WA, Australia

Accepted 11 June 2019

Abstract

Background Maintaining glycaemic control during exercise presents a significant challenge for people living with Type 1 diabetes. Significant glycaemic variability has been observed in athletes with Type 1 diabetes in competitive contexts. While very-low-carbohydrate ketogenic diets have been shown to minimize glycaemic excursions, no published data have examined if this translates to exercise.

Case report We report the case of a 37-year-old man with Type 1 diabetes who successfully undertook a 4011 km cycle across Australia over 20 consecutive days whilst consuming a very-low-carbohydrate ketogenic diet. Continuous glucose monitoring data capture was 98.4% for the ride duration and showed remarkable glycaemic stability, with a standard deviation of 2.1 mmol/l (average interstitial glucose 6.1 mmol/l) and 80.4% of time spent within a range of 3.9–10 mmol/l. Interstitial glucose was <3 mmol/l for 2.1% of this time, with only a single episode of symptomatic hypoglycaemia prompting brief interruption of exercise for carbohydrate administration.

Conclusion This case demonstrates the viability of a very-low-carbohydrate ketogenic diet in an individual with Type 1 diabetes undertaking exercise. While the effect of a very-low-carbohydrate ketogenic diet is yet to be examined more broadly in athletes with Type 1 diabetes, the glycaemic stability observed suggests that fat adaptation may attenuate glycaemic swings and reduce reliance on carbohydrate consumption during exercise for maintaining euglycaemia.

Diabet. Med. 00: 1–5 (2019)

Management of Type 1 Diabetes With a Very Low–Carbohydrate Diet

Belinda S. Lennerz, MD, PhD,^{a,b} Anna Barton, MD,^c Richard K. Bernstein, MD,^d R. David Dikeman, PhD,^e Carrie Diulus, MD,^f Sarah Hallberg, DO,^g Erinn T. Rhodes, MD, MPH,^a Cara B. Ebbeling, PhD,^{a,b} Eric C. Westman, MD,^h William S. Yancy Jr, MD,^h David S. Ludwig, MD, PhD^{a,b}

Upsala J Med Sci 110 (3): 267–273, 2005

A Low Carbohydrate Diet in Type 1 Diabetes: Clinical Experience – A Brief Report

Jørgen Vesti Nielsen, Eva Jönsson, Anette Ivarsson


Department of Medicine, Blekingesjukhuset, Karlshamn, Sweden

Case report in children

- A series of 6 children who were following a LCD
- All experienced difficulties with growth while on the LCDs, but all were actually undernourished.
- My concern is that there appeared to be a lack of empathetic support to the families, and I would have liked to have seen more support for them, other than getting them back onto high carb diets.
- Nevertheless, we need to be cautious with children and follow their growth and nourishment closely


Received: 1 January 2017 | Revised: 8 March 2017 | Accepted: 9 March 2017

DOI: 10.1111/pedi.12527

WILEY 

CASE REPORT

Endocrine and metabolic consequences due to restrictive carbohydrate diets in children with type 1 diabetes: An illustrative case series

Martin de Bock^{1,2,3} | Kristine Lobley⁴ | Donald Anderson^{5,6,7} | Elizabeth Davis^{1,2,3} |
Kim Donaghue^{8,9} | Marcelle Pappas^{5,6,7} | Aris Siafarikas^{1,2,3,10} | Yoon Hi Cho^{11,12} |
Timothy Jones^{1,2,3} | Carmel Smart^{5,6,7} 

Case reports: Reversal of Type 1 diabetes???



Available online at
ScienceDirect
www.sciencedirect.com

Research letter

A low-carbohydrate high-fat diet initiated promptly after diagnosis provides clinical remission in three patients with type 1 diabetes

ARTICLE INFO

Keywords:

Low-carbohydrate high-fat diet

Remission

Type 1 diabetes

CASE REPORT

OPEN ACCESS

Type 1 diabetes mellitus successfully managed with the paleolithic ketogenic diet

Csaba Tóth, Zsófia Clemens

Clinical Trials in LCHF and Type 1 diabetes

Received: 29 January 2019 | Revised: 18 March 2019 | Accepted: 26 March 2019

DOI: 10.1111/dom.13725

ORIGINAL ARTICLE

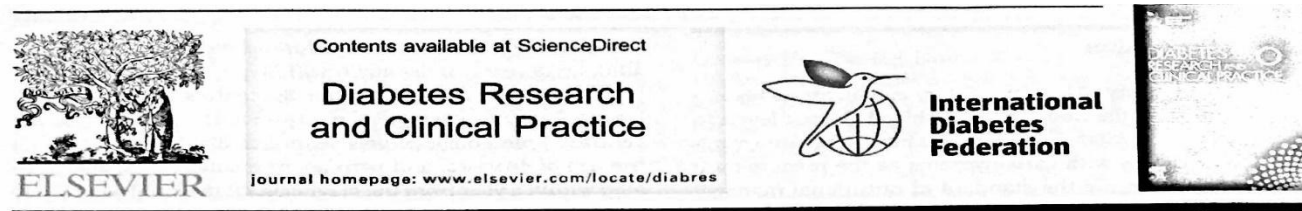
WILEY

Low versus high carbohydrate diet in type 1 diabetes: A 12-week randomized open-label crossover study

Signe Schmidt PhD^{1,2,3} | Merete B. Christensen MD¹ | Nermin Serifovski RN¹ |
Camilla Damm-Frydenberg RD¹ | Jens-Erik B. Jensen PhD^{1,4} | Tina Fløyel PhD³ |
Joachim Størling PhD³ | Ajenthen Ranjan PhD^{1,2,5} | Kirsten Nørgaard DMSc^{1,3}

- 14 started and 10 completed
- All patients partook in both arms of the study
- 98g vs 246g of carbohydrates
- Reduced variability and less hypos
- Weight loss 2kg vs gain of 2.6 in HCD
- No change in HbA1c (average 7.5%) or CV markers

Clinical trial continued



Contents available at ScienceDirect

Diabetes Research and Clinical Practice

Journal homepage: www.elsevier.com/locate/diabres

International Diabetes Federation

Dietary carbohydrate intake and cardio-metabolic risk factors in type 1 diabetes

Aila J. Ahola ^{a,b,c}, Carol Forsblom ^{a,b,c}, Valma Harjutsalo ^{a,b,c,d}, Per-Henrik Groop ^{a,b,c,e,*},
on behalf of the FinnDiane Study Group

Check for updates

- 69 patients out of a larger group of 902 type 1 patients who were following a lower carb diet (<130g/day)
- LCD arm reduced BMI, Reduced SMBG Variability and lower diastolic blood pressures
- Women slightly raised HDL levels, men slightly raised cholesterol and Non-HDL levels, HbA1c 7.6% vs 8.1%
- Reduced CVD events in LCD arm!

Review articles






nutrients



Review

Carbohydrate Restriction in Type 1 Diabetes: A Realistic Therapy for Improved Glycaemic Control and Athletic Performance?

Sam N. Scott ^{1,*} , Lorraine Anderson ², James P. Morton ³, Anton J. M. Wagenmakers ³  and Michael C. Riddell ^{1,4} 






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Review

Low-Carb and Ketogenic Diets in Type 1 and Type 2 Diabetes

Andrea Mario Bolla , Amelia Caretto , Andrea Laurenzi, Marina Scavini and Lorenzo Piemonti ^{*} 

Current Diabetes Reports (2019) 19: 27
<https://doi.org/10.1007/s11892-019-1153-2>

PSYCHOSOCIAL ASPECTS (SS JASER, SECTION EDITOR)



Medical and Psychological Considerations for Carbohydrate-Restricted Diets in Youth With Type 1 Diabetes

Katherine A. S. Gallagher ¹ · Daniel DeSalvo ² · Justin Gregory ³ · Marisa E. Hilliard ⁴

The concerns from these studies and reviews

- Slightly reduced growth specifically in children
- CVD and weight due to high fat, but no actual published data confirming this.
- Conflict with health care providers who largely do not support LCHF diets.
(on “type one grit” 50% said HCPs were unsupportive)
- “Treat insecurity” where children may overeat on treats when they have been restricted
- May lead to disordered eating and insulin abuse
- More conflict around food at home
- May see food as “good” or “bad”
- Whole family diet may need to change
- (Seem to be many more assumptions in literature about nutritional deficiencies in Low carb diets than are actually proven)
- Assumption that adherence rates are lower than adherence to Low fat diets, but no data shown

The pros of Low carbohydrate diets

- Less variability
- More time spent in normoglycaemia
- Less hypoglycaemia
- Lower amounts of insulin use
- Less weight gain
- Improved moods
- Lower HbA1c, higher rates of 'Normal' levels
- More satisfaction with diet and treatment
- Lower triglycerides and improved HDL
- Lower CVD rates (assumption)
- Only known cases of reversal using LCHF diets
- Longer periods in honeymoon phase.
- Longevity
- No real limitation in exercise ability in patients who are committed

Personal experience

- From the perspective of a doctor who is treating patients with type 1 diabetes
- I have a full range of patients on the whole spectrum of good control to poor control and they all teach me daily
- Having type 1 diabetes is tough and lonely at times.
- The patients need a team approach to the issues which includes a dietician, well versed in type 1 diabetes and LCHF lifestyles.
- Try to take small steps, eg changing one meal and testing it regularly.
- Test regularly, or use CGM if possible.
- Never give up

Conclusions

- I have tried to look at some of the evidence for LCHF lifestyles in type 1 diabetes patients, by looking at case reports, some clinical trials and some reviews.
- While the literature remains cautious about using LCHF, there does seem to be an increase in interest in this lifestyle.
- From the studies however, I feel there is a good deal to be positive about and the benefits far outweigh the risks.
- For those in my practice who have pursued a LCHF lifestyle, the benefits have been life-changing.
- I will certainly continue to highlight the lifestyle in a positive way, but will be aware of the risks