Fad Diets in the Treatment of Diabetes

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Abstract

Use of the term "fad diet" reflects the contentious nature of the debate in the treatment of diabetes and generally targets diets based on carbohydrate restriction, the major challenge to traditional dietary therapy. While standard low fat diets more accurately conform to the idea of a practice supported by social pressure rather than scientific data, it is suggested that we might want to give up altogether unscientific terms like "fad" and "healthy." Far from faddish, diets based on carbohydrate restriction have been the historical treatment for diabetes and are still supported by basic biochemistry and it is argued that they should be considered the "default," diet, the one to try first, in diseases of carbohydrate intolerance or insulin resistance. The barrier to acceptance of low-carbohydrate diets in the past has been concern about saturated fat which might be substituted for the carbohydrate that is removed. However, recent re-analysis of much old data shows that replacing carbohydrate with saturated fat is, if anything, beneficial. The dialectic of impact of continued hemoglobin A1c vs. effect of dietary saturated fat in the risk of cardiovascular disease is resolved in direction of glycemic control. Putting biased language behind us and facing the impact recent results which point to the value of low-carbohydrate diets would offer patients the maximum number of options.

Introduction

"Fad" is not a scientific term and is clearly contentious. Conversely, the widely used term "healthy" is also not scientific. The two terms, like positive and negative electrical charge, are probably defined by their being opposites. The real criterion for a fad diet, however, is that you don't like it. Fad diets are the other guy's diet. This may mean everybody, as in the case of the American Heart Association's *No-Fad Diet* which thinks all other diets are fads [1]. In practical terms, there are two kinds of fad diets: first, those that have some quirky feature which hardly anybody adheres to (unlike fads in fashion), and second, the *bête noire* of the nutritional establishment, the Atkins diet. Or more generally, any form of low-carbohydrate diet. What rankles researchers is that such diets out-perform "healthy" diets for however long they are compared. In diabetes, where carbohydrate intolerance is more or less the defining feature and some of form of carbohydrate restriction is almost a universal recommendation, attacking low-carbohydrate diets might seem irrational, but it is done often. A review of low-carbohydrate diets by Steven R. Smith stated:

> "Most fad diets are just that — a bright flash that quickly fades, only to be followed by another best-seller and a new face on the talk-show circuit. The high-fat, high-protein, low-carbohydrate (HPLC) diet has outlived the rest of the pack [2]."

Such a statement can be criticized for its literacy (most fads are fads) and its hostile tone; there are many implementations of carbohydrate-restricted diets but "*the* low carbohydrate diet" is attacked as if there were only one. The statement would not have been so jarring if published in an opinionated blog. However, it was published in the *New England Journal of Medicine*. And "...outlived the rest of the pack?" It's a fad, or it's not a fad?

Smith's article was about the report by Foo, *et al*. on the effect of low-carbohydrate diets on atherosclerosis [3] and so was not directly about diabetes. It was, in fact, not about people but rather about mice. To be more precise, it was a study of apoE-

knockout mice, that is, mice genetically engineered to be susceptible to atherosclerosis and the low-carbohydrate diet that the mice were fed was assumed to be a more significant influence than the difference in species or the effect of the gene deletion. The fact that the low-carbohydrate arm was more susceptible to atherosclerosis suggests that low-carbohydrate diets are unlikely to become a fad among apoE-knockout mice.

It might be said that any diet that was intended as therapy rather a background "lifestyle," or any diet that has specific recommendations deriving from the control of the glucose-insulin axis might fall into the category of a fad in the sense that treatment of diabetes is so overwhelmingly reliant on pharmacology. For example, the American Diabetes Association (ADA) states that sucrose-containing foods are all right for people wiht diabetes if "covered with insulin or other glucose lowering medications [4]."

It's not exactly about fads. It's about the hostility of establishment nutrition towards low carbohydrate diets. While few are as tasteless as Michael Lean's *Is Atkins Dead (Again)?* [5] — even lawyers are considerate of widows — decorum pretty much goes by the wayside in attacking carbohydrate restriction. You can call anything a fad if you do not cite the scientific work supporting it and instead, cite the Atkins book. Or worse. The first line of the paper by Fung, *et al*. [6], a retrospective epidemiological study, nominally supporting a low-carbohydrate diet as long as it was based on vegetable protein, says that "Low-carbohydrate diets have been claimed to promote weight loss and improve blood cholesterol levels and blood pressure (1, 2)." The difference between "claimed" and "demonstrated" might be said to be a matter of opinion but their reference number 2 in the paper is to *Low-Carb Dieting for Dummies*, which is unscientific at best. (Oddly, *Epidemiologie für Dummies* is only available in the German edition possibly due to social pressure from the Harvard School of Public Health). The paper does say, "the risk estimates do not directly translate to the assessment of benefit or risk associated with the popular versions of the diet." The first sentence of the paper, cited above, and the response in the press suggests that this disclaimer is disingenuous.

A final example can be found in TheHeart.org, a subsidiary of WebMD, Although TheHeart.org is not a scientific journal, the publication of the statement by Dr.Robert Eckel, (former president of the American Heart Association (AHA)) that he is "vehemently opposed to any such outcomes study with Atkins" [7] seems to have crossed some line in resistance to new information.

Which is the fad?

If the question were really about fads, that is, diets that do not have scientific backing, that have no underlying principle and do not perform well in the long term, we would have to see as a fad, the low-fat, low-cholesterol recommendations, dating back to Ancel Keys's six-country study, the hula-hoop of epidemiological studies [8], and Senator George McGovern's decision that we "don't have the luxury...of waiting until every last shred of evidence is in" to make recommendations [9]. Fads are sustained by social acceptance rather than inherent qualities. In the nutrition world, there are many disclaimers about good fats or bad fats, but if you show up at a meeting of any health agency without demonizing fat, you are likely to be an outcast. The strong recommendations against saturated fat by the Report of the Dietary Guidelines for America Committee (DGAC) [10] and the nearly maniacal video linking saturated fat to *trans*-fats on the American Heart Association website [11] make clear what's in and what's out.

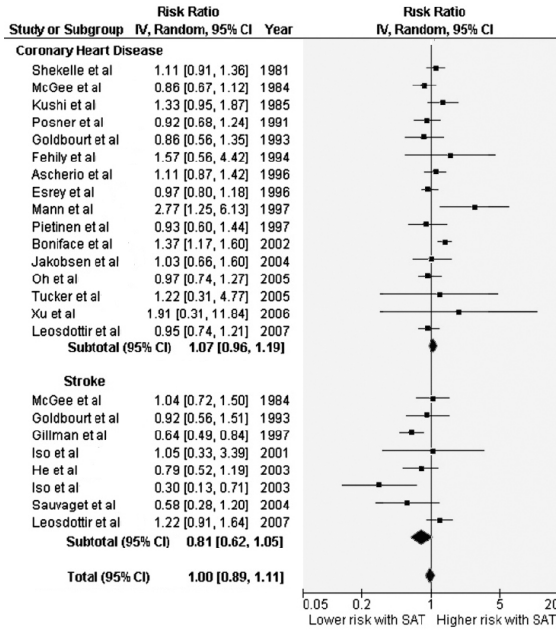

Figure 1. Associations between saturated fat intake in relation to coronary heart disease and stroke. SAT, saturated fat intake; IV, inverse variance. Redrawn from reference [12].

Two recent meta-analyses of the affect of saturated fat on cardiovascular disease (CVD) [12, 13] point up the extent to which the proscription against saturated fat has had its basis in sociology rather than fact. As shown in **Figure 1**, pooled data fail to indicate any

significant effect of saturated fat on CVD outcome. Although the paper by Jakobsen, et al. [13] is included in the DGAC Health Evidence Library, the Report of the DGAC does not cite the conclusion and, in fact, recommends lowering saturated fat consumption still further. The report has generally been criticized for its refusal to face the evidence from its own library [14]. A remarkable feature in Figure 1 is that most of the individual studies showed no effect; the statistical rule is that if the 95 % confidence interval crosses 1.0, that is taken as no effect; Some of these reports date back twenty-five years. Why were the conclusions from these studies not accepted? Why did we keep doing them over and over? Well, that's how it is with fads.

The concept of glycemic index (GI) and glycemic load is of interest in the survey of changing fashion. It was traditional to say that simple sugars increased blood glucose rapidly while complex carbohydrates (in the original meaning of polysaccharides) were absorbed more slowly. At some point, Jenkins and coworkers asked if this were really true. The results showed that the ability of foods to raise blood glucose was not so easily predicted [15] leading to a glycemic index which predicted the experimental effect of food on increase in glucose for the two hours following ingestion. This represented an important conceptual insight, but while low-GI diets follow from the same idea and may be a moderate form of low carbohydrate diet, they are frequently offered as an alternative to a low-carbohydrate diet.

Two recent studies in people with type 2 diabetes provide interesting comparisons. Jenkins, *et al*. compared a low glycemic index diet with a standard high cereal diet [16]. At the same time, Westman published a comparison of a low-GI diet with a true low-carbohydrate diet [17]. The generally superior performance of the low carbohydrate diet to the cereal diet and both versions of the low-GI is evident in **Figure 2**.

The problem may be historical. Carbohydrate restriction was the established treatment for diabetes in the pre-insulin era [18]. Because the predominant form of diabetes in this era was type 1, it is likely that the discovery of insulin cast diabetes as a deficiency disease which had to be treated with administered insulin or other drugs. The persistence of this view of diabetes may have repressed the understanding of diabetes as a metabolic disease which might be more relevant to type 2 diabetes, the prevalent form today. The latter approach would predict the value of carbohydrate reduction. The evolution of the low fat-diet heart hypothesis, however, solidified the high carbohydrate fad.

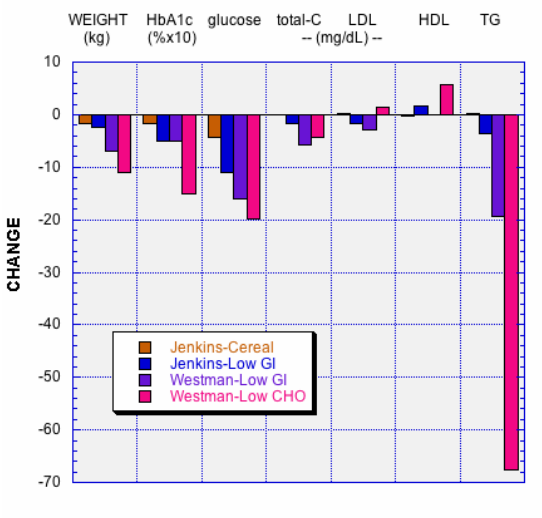

Figure 2. Comparison of cereal-based diets and low-GI diets of Jenkins, *et a*l. [16] and comparison of low-GI diets with low-carbohydrate diets of Westman, *et al*. [17]. Changes are shown as percentage for the indicated parameters.

Definitions.

One of the barriers to good understanding of the problem is the lack of agreed-upon definitions. For example, beyond the difference in species and genetics of the apoE-knockout mouse, mentioned above, the low-carbohydrate diet used by Foo, *et al*. had an exceedingly high protein content that would not correspond to any diet recommended for humans [42]. In the same vein, the paper by Fung, *et al*. [6] entitled *Low-carbohydrate diets and…* did not impose any diets at all but rather set up arbitrary definitions of low-carbohydrate diets (one that would not be accepted by most researchers in the area) and retrospectively applied the definition to previous studies.

The following suggestion for operational definitions with the underlying rationale has been proposed [19, 20]:

- **Low carbohydrate diet**: less than 130 g/d or less than 26 % of a nominal 2000 kcal/d diet is The American Diabetes Association definition which seems appropriate [4].

- **Very low-carbohydrate ketogenic diet (VLCKD)**: less than 20-50 g/d or less than approximately 10 % of the 2000 kcal/d diet. Generally, although not always accompanied by ketosis, this is the level of the early phases of popular low carbohydrate diets such as Protein Power, Atkins and South Beach Diets.

- **Moderate Carbohydrate Diet. 26 - 45 %**. The upper limit is the approximate carbohydrate intake

before the obesity epidemic (43 %). Current consumption is about 49 % Joslin Nutrition Guidelines recommends 40% carbs with low glycemic index and high fiber and minimum of 130 gm/day for type 2 patients who are overweight or obese; patients on low calorie diet of 1200 kcal, will be on 45% carbohydrates to maintain a minimum of 130 grams.

- **High Carbohydrate Diet. Greater than 45 %**. The ADA is not clear on its recommendations but generally recommends high carbohydrate.

Finally, before relegating diets to the category of fads, it would make sense to find out what people actually consume on such diets. LaRosa was the first to show that low-carb dieters generally remove carbohydrate without significant replacement from either fat or protein [21], and this has proved to be a general pattern [22-26]. There is, of course, a *de facto* increase in the percentage of fat but little change in absolute consumption; for example, Forsythe, *et al*. [26] found that subjects on a VLCKD increased fat consumption from an average of 36.2 % at baseline to 58.9 %. Because the diet was hypocaloric, however, in absolute terms, this represented a switch from 97.0 (± 35.2) g/d to only 100.2 (± 37.9) g/d. In terms of food consumed, a poll of The Active Low-Carber Forums (http://forum.lowcarber.org/), an on-line support group found that the major change was increased consumption of vegetables and leafy greens and not large increases in the meat or fat as popularly portrayed [27].

Adherence is better on low-carbohydrate diets.

The essential feature of fad-like behavior is its transient nature. It is frequently said of low-carbohydrate diets that they have poor adherence. The origins of this idea are unknown since almost every experimental comparison of low-carbohydrate with low-fat diets shows them to have at least comparable and usually better adherence (**Table 1**) than the usual low-fat control.

Adherence is, in any case, at least as much a matter of encouragement and support for the dieter. Persistence of dieters in the face of pervasive negative attitudes toward low carbohydrate diets might be taken as an indication of their efficacy. Along these lines, the DGAC committee report claims that low carbohydrate diets are difficult to maintain while admitting that adherence to the their own guidelines is poor [10], that is, they see failure to comply to a low-carbohydrate diet as the fault of the diet while failure to comply to a low-fat diet is the fault of the patient. Study of the Active Low-Carber Forums is also informative. In distinction to the predictions of faddish behavior, membership has increased monotonically and is very close to 130,000 members as of December, 2010. In our survey, members were asked if they had lost 30 lbs or more and kept it off for one year [27]. This bench mark was set by the National Weight Registry (NWR) which is widely cited for their identification of 4,000 participants over an approximately 10 year span who met this criterion, most of whom had been on a low fat diet. By comparison, we identified, in the one month survey, 1,088 dieters using low carbohydrate diets who had met the NWR criteria suggesting that adherence to a low-carbohydrate diet is better than alternatives.

Study	**Attrition Rate (%)**	
	Low-fat	**Low-CHO**
Yancy et al., 2004 [25]	45	24
Gardner et al., 2007 [23]	22	12
Samaha et al., 2003 [45]	47	33
Dansinger et al., 2005 [22]	50	48
Brehm et al., 2003 [44]	26	15
Foster et al., 2003 [34]	43	39
Tay et al., 2008[43]	18	20

Table 1. Attrition rates of low-fat and low-carbohydrate diets

Carbohydrate-restriction in diabetes.

A recent review summarized the arguments for low-carbohydrate diets for the treatment of diabetes [28]. The major features:

1. Carbohydrate restriction improves glycemic control, the primary target of nutritional therapy and reduces insulin fluctuations [17][29], and references in [28] and [30-32]).

2. Low-carbohydrate diets are at least as effective and generally more effective than low-fat diets for weight loss [[33-35] 19, 25-27].

3. Carbohydrate-restriction is the requirement of the diet as described in definitions below. While most studies show limited increase in total fat, substitution of any fat, even saturated fat, for carbohydrate is at least neutral but generally beneficial for markers of and incidence of cardiovascular disease.

4. Carbohydrate restriction ameliorates all of the features of metabolic syndrome while higher carbohydrate diets are associated with postprandial hyperglycemia and hypertriglyceridemia. [30-32].

5. The beneficial effects of carbohydrate restriction do not require weight loss [29].

The review [28] and a similar narrative review on metabolic syndrome [31] provided a global perspective and a likely effective mode of treatment. As such, one would have expected at least a rebuttal as to why its promise should not be exploited. Instead, the papers have been almost completely ignored, again, following the idea that low-carbohydrate diets have their support in the popular media and the scientific literature can be ignored. The net effect is that options available to patients are reduced.

Bottom line: The bigger threat to CVD: Saturated fat or hemoglobin A1c ?

Design of diet for diabetes can probably be boiled down to two considerations embodied in **Figures 1** and **3**: which is the greater threat to CVD in people with diabetes? Dietary fat, specifically saturated fat? Or glycemic control? **Figure 3** shows results from the UKPDS 35 prospective study on the association of hemoglobin A1c with macrovascular and microvascular complications of type 2 diabetes [36]. In distinction to the effects of saturated fat shown in **Figure 1** that are long range and conjectural at best, the effect of HbA1c correlates strongly with immediate progression of disease and long term outcome (more for microvascular complications than macrovascular but even the latter has good correlation above 7 % HbA1c). Recent results show, as well, that the source of plasma saturated fat, the presumed agent for any deleterious effects comes primarily from dietary carbohydrate not from dietary saturated fat [26, 30].

The underlying mechanism is understood and depends on the anabolic effects of the hormone insulin [20, 30, 37]. As Stephen R. Smith puts it: "In many ways, it is attractive to believe that manipulation of macronutrient composition might control body weight and improve health." It's attractive because it is fundamental biochemistry [38, 39] and while metabolism is not considered a fad, it may have changed over the years.

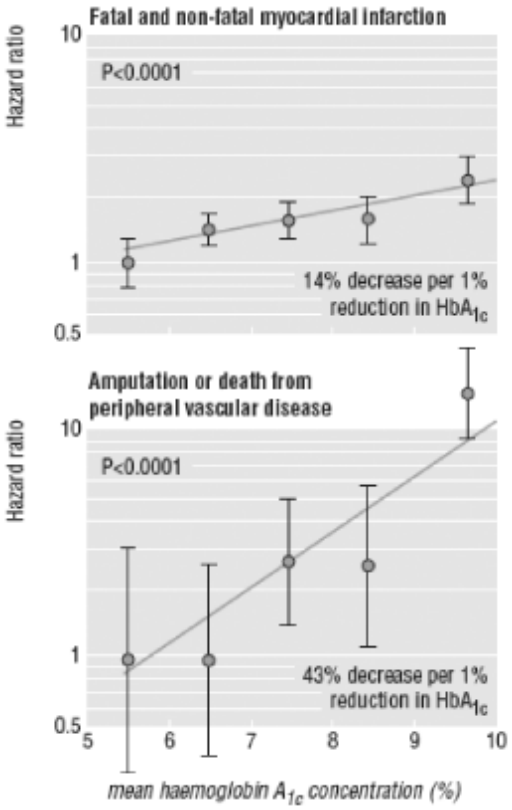

Figure 3. Hazard ratios, with 95% confidence intervals as estimate of association between haemoglobin A1c concentration and myocardial infarction or microvascular end points. Redrawn from reference [36].

Safety of carbohydrate-restricted diets.

One cannot prove safety. One can only prove absence of harm. What would it be like if we detected harm in a low carbohydrate trial? There are numerous examples of unacceptable side effects of drugs. Skin flushing, for example, can be sufficiently severe as to curtail the use of niacin. Severe side effects of statins such as rhabdomyolosis are rare but not zero and muscle fatigue, weakness and cramping are more frequent and increased by exercise [40]. In the area of glycemic control, the fate of Avandia® (rosiglitazone), where a high risk of heart attacks has been identified in users, is still in the news (e.g. [41]). Similarly, the ACCORD study in which patients assigned to an intensive-therapy group showed higher mortality than those assigned to standard therapy has led to the rather odd idea that there is "previously unrecognized harm of intensive glucose lowering," while it is most likely that the intensity of the pharmacologic treatment that is the source of the harm. No such serious outcome has been identified in carbohydrate restriction either in experimental trials or in the general population

although it is reasonable to say that people have been looking hard for such problems. Westman and Vernon [42] have suggested that intensive glucose lowering in ACCORD might have been better effected by carbohydrate restriction which reliably reduces or eliminates the need for medication.

Recommendations.

Taking diabetes seriously would require that all approaches be considered and that we consider that the enemy is the disease, not other researchers. To carry this out, it is suggested that we give up "fad" as applied to diets that are studied seriously by other researchers and possible even give up terms like "healthy" diets at least until we can find one that stops the diabetes epidemic. Progress may also depend on having agreed-upon definitions of diets and, perhaps more important, what such diets are really like as implemented.

In the Meantime: the default diet for diabetes.

Until we reach agreement on the recommended definitions and conditions, we recognize that "fad" diet is a term meant to disparage people from trying a dietary strategy that, in the case of low-carbohydrate diets is, in fact, not unconventional [27] or recent [18]. While, low-carbohydrate diets have always been considered one alternative, recent results and the underlying physiology suggest that it should be the default diet, the one to try first.

It might be said that basic science tends to take a bottom-up approach, placing emphasis on fundamental mechanism, in this case the importance of the glucose-insulin axis, whereas medicine frequently favors a top-down approach favoring long, large-scale trials. I would argue that the nature of diabetes suggests that we start with underlying biochemistry, placing the burden of proof on those who think that the short-term effects of carbohydrate restriction will not persist as long as the diet is adhered to. Along which lines I offer the following real conversation.

> **Endocrinologist**: There are no long term studies on low-carbohydrate diets in diabetes.
> **RDF**: Well, let me ask you this. Suppose, for some reason, your patient had gone on the Atkins diet since their last appointment. If they came in having lost weight, with improved HbA1c, improved lipid panel and you had to reduce their medication, what would you do? Tell them to stop because there are no long term studies? What would you do?
> **E**: I would tell them to keep doing it.
> **RDF**: Good call.

CONCLUSION

In summary, this discussion raises several questions: Is the continued use of the term "fad," and the general hostile characterization of alternative nutritional recommendations, productive? Are we doing so well in fighting diabetes that we can afford to dismiss low-carbohydrate diets, the major "fad?" Have we adequately taken account of recent science in nutritional recommendations? Is there a need for "bi-partisanship?" Are we dealing appropriately with patients who have discovered nutritional therapies for themselves?

If it is really possible that a change in the general approach to nutritional therapy would be useful, isn't it up to the major private and government health agencies to take the lead?

A report in the Los Angeles Times. "A Reversal on Carbs" (http://www.latimes.com/health/la-he-carbs-20101220,0,5893431,full.story) might be taken as progress on the issues raised in this paper compared to, for example, "Fighting the Fad - Low Carbohydrate/ High Protein Diets," (http://www.thedoctorwillseeyounow.com/content/nutrition/art2044.html?getPage=1)

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