Topic Brief: Low and Very Low Carbohydrate Diets for People with Diabetes Type 2 and Pre-diabetes

Date: 9/6/2022
Nomination Number: 1011

Purpose: This document summarizes the information addressing a nomination submitted on June 3, 2022, through the Effective Health Care Website. This information was used to inform the Evidence-based Practice Center (EPC) Program decisions about whether to produce an evidence report on the topic, and if so, what type of evidence report would be most suitable.

Issue: The nominator is requesting a systematic review on low carbohydrate and very low carbohydrate diets for people with diabetes type 2 and prediabetes. They wish to use the review to advocate for endorsement by Federal agencies and others.

Findings: We found multiple systematic reviews that address the topic. The EPC Program develops systematic reviews and other evidence reviews to inform healthcare decision-making and does not endorse one intervention or strategy over another. For these reasons the EPC Program will not consider this topic further.

Background

More than 122 million Americans are living with diabetes (37.3 million) or prediabetes (96 million)[1]. Approximately 90-95% of them have type 2 diabetes. Type 2 diabetes most often develops in people over age 45. Diabetes increases the risk of heart disease and stroke and can lead to other serious complications, such as kidney failure, blindness, and amputation of a toe, foot, or leg. In 2017, the total estimated cost of diagnosed diabetes was $327 billion, including $237 billion in direct medical costs and $90 billion in absenteeism, reduced productivity, and inability to work[2].

Some people with type 2 diabetes can control their blood glucose level by making lifestyle changes[3]. These lifestyle changes include consuming healthy meals and beverages, limiting calories if they have overweight or obesity, and getting physical activity. Lifestyle changes can cut risk of developing type 2 diabetes by as much as 58% (71% for those 60 or older). In April 2018, the lifestyle change program became a covered service for Medicare beneficiaries with prediabetes[2].

Low carbohydrate diet has been defined as <130 grams/day and very low carbohydrate diet as <50 grams/day. Other diets that are also considered low in carbohydrates are the ketogenic diet and diets with a low glycemic index[4].

A 2019 consensus report from the American Diabetes Association recommends for people with type 2 diabetes, counseling on eating patterns that replace foods high in carbohydrate with foods lower in carbohydrate and higher in fat may improve glycemia, triglycerides, and HDL-C. They recommend consultation with a knowledgeable practitioner at the onset to prevent dehydration and reduce insulin and hypoglycemic medications to prevent hypoglycemia[5].

The nominator, Virta Health, has developed a proprietary approach to diabetes management, including individualized nutrition therapy and continuous remote medical care. They wish to use the review to advocate for endorsement by Federal agencies.

Scope

1. What is the effectiveness and harms of low- and very low-carbohydrate diets for people with diabetes type 2?
2. What is the effectiveness and harms of low and very low-carbohydrate diets for people with prediabetes?

	1. Diabetes type 2	2. Prediabetes
Population	Adults 18 years and older with diabetes type 2	Adults 18 years and older with prediabetes
Intervention	• Low carbohydrate diet 51-130 gm/day (low glycemic index, ketogenic diet) • Very low carbohydrate diet 20 to 50 gm/day	• Low carbohydrate diet 51-130 gm/day (low glycemic index, ketogenic diet) • Very low carbohydrate diet 20 to 50 gm/day
Comparator	Unrestricted diet Diet other than low/very low carbohydrate diet	Unrestricted diet Diet other than low/very low carbohydrate diet
Outcome	HbA1C, glycemic control, weight loss, use of diabetes medications, QOL	HbA1C, development of diabetes, weight loss, QOL
Setting	Outpatient	Outpatient

Abbreviations: HbA1C=hemoglobin A1c; QOL=quality of life

Assessment Methods

See Appendix A.

Summary of Literature Findings

We found ten systematic reviews on low or very low carbohydrates for people with type 2 diabetes. One looked at a broad array of diets[6]; one compared the ketogenic diet to low carbohydrate diet[7]; one focused only on ketogenic diet[8, 9]; five focused on low carbohydrate diets[10-14]; one on very low carb ketogenic diet[15]; and two on low glycemic diet[16, 17].

Of the ten reviews, three used Grading of Recommendations, Assessment, Development and Evaluations (GRADE)[6, 11, 16]; one was a 2022 umbrella review[6] and one was used to inform a European guideline[16].

We identified no systematic reviews specifically on prediabetes but identified four on overweight individuals. One was on very low carbohydrate diets[18]; two on the ketogenic diet[19, 20]; and one on low carbohydrate diet[21].

Summary of Selection Criteria Assessment

Diabetes and prediabetes are prevalent in the United States, and lifestyle modification, including diet, are universally recommended[22, 23]. Guidance stresses the importance of interventions to facilitate and sustain lifestyle modification to prevent or delay long-term complications[24]. There are multiple reviews on this topic.

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Appendix A: Methods

We assessed nomination for priority for a systematic review or other AHRQ Effective Health Care report with a hierarchical process using established selection criteria. Assessment of each criteria determined the need to evaluate the next one. See Appendix B for detailed description of the criteria.

Appropriateness and Importance

We assessed the nomination for appropriateness and importance.

Desirability of New Review/Absence of Duplication

We conducted a search for existing systematic reviews. We searched for high-quality, completed or in-process evidence reviews published in the last three years August 2019 to August 2022 on the questions of the nomination from these sources:

- AHRQ: Evidence reports and technology assessments
    - AHRQ Evidence Reports https://www.ahrq.gov/research/findings/evidence-based-reports/index.html
    - EHC Program https://effectivehealthcare.ahrq.gov/
- US Department of Veterans Affairs Products publications
    - Evidence Synthesis Program https://www.hsrd.research.va.gov/publications/esp/
    - VA/Department of Defense Evidence-Based Clinical Practice Guideline Program https://www.healthquality.va.gov/
- Cochrane Systematic Reviews https://www.cochranelibrary.com/
- PROSPERO Database (international prospective register of systematic reviews and protocols) http://www.crd.york.ac.uk/prospero/
- PubMed https://www.ncbi.nlm.nih.gov/pubmed/

Impact of a New Evidence Review

The impact of a new evidence review was qualitatively assessed by analyzing the current standard of care, the existence of potential knowledge gaps, and practice variation. We considered whether it was possible for this review to influence the current state of practice through various dissemination pathways (practice recommendation, clinical guidelines, etc.).

Appendix B. Selection Criteria Assessment

Selection Criteria	Assessment
1. Appropriateness	
1a. Does the nomination represent a health care drug, intervention, device, technology, or health care system/setting available (or soon to be available) in the U.S.?	Yes
1b. Is the nomination a request for an evidence report?	Yes
1c. Is the focus on effectiveness or comparative effectiveness?	Yes
1d. Is the nomination focus supported by a logic model or biologic plausibility? Is it consistent or coherent with what is known about the topic?	Yes
2. Importance	
2a. Represents a significant disease burden; large proportion of the population	More than 122 million Americans are living with diabetes (37.3 million) or prediabetes (96 million). Approximately 90-95% of them have type 2 diabetes. Type 2 diabetes most often develops in people over age 45.
2b. Is of high public interest; affects health care decision making, outcomes, or costs for a large proportion of the US population or for a vulnerable population	Yes
2c. Incorporates issues around both clinical benefits and potential clinical harms	Yes
2d. Represents high costs due to common use, high unit costs, or high associated costs to consumers, to patients, to health care systems, or to payers	In 2017, the total estimated cost of diagnosed diabetes was $327 billion, including $237 billion in direct medical costs and $90 billion in absenteeism, reduced productivity, and inability to work.
3. Desirability of a New Evidence Review/Absence of Duplication	
3. A recent high-quality systematic review or other evidence review is not available on this topic	We identified multiple systematic reviews. Of these three used GRADE.
4. Impact of a New Evidence Review	
4a. Is the standard of care unclear (guidelines not available or guidelines inconsistent, indicating an information gap that may be addressed by a new evidence review)?	Guidance is available, though the focus is less on exactly which diet, and rather on adherence to lifestyle modifications over the long-term.
4b. Is there practice variation (guideline inconsistent with current practice, indicating a potential implementation gap and not best addressed by a new evidence review)?	Lifestyle modification, including diet, is recommended. There are a variety of different diets that are available.

Abbreviations: GRADE= Grading of Recommendations, Assessment, Development and Evaluations