

The Impact of a Low Carbohydrate Diet on Oral Medication Use In Adults with Type 2 Diabetes Mellitus

Introduction

- Type 2 diabetes mellitus (T2DM) is estimated to affect 425 million people worldwide (Robertson, 2020).
- Its pathogenesis is only partially understood, and treatment options are diverse and multifaceted, with lifestyle management as a fundamental aspect of diabetes care.
- The physiologic and metabolic effects of low carbohydrate dietary intake is a potentially viable option to adjunct or alter oral medication use in the management of T2DM (Bloch, 2005).

Design/Sample

- A literature review was performed with respect to the following PICOT question: In adults over the age of 18 years old living with type 2 diabetes mellitus (P), how does a low carbohydrate diet (LCD) (I) compared to a non-low-carbohydrate diet (C) affect medication dosing (O) after at least 6 months (T)?
- Examples of Google Scholar terms: "American diabetes association," "low carb," "standards of care."
- Examples of PubMed term: ((type 2 diabetes) AND AND outcomes) AND ("Hypoglycemic Agents"[MeSH]).

Analysis

- The RCTs and meta-analyses examined for this review looked at the effect of LCD on multiple indicators of T2DM status including HbA1c, fasting blood glucose (FBG), weight (wt), glycemic index, lipid levels, blood pressure (BP), and oral diabetes medication use.

Results

Author	Framework	Study Findings
Saslow et al. (2017)	Randomized controlled trial (RCT) looking at T2DM outcomes in participants following a LCD or moderate-carbohydrate diet (MCD) over 12 months.	<ul style="list-style-type: none"> • LCD group: of ten total participants taking DPP-4 inhibitors, the 6 in the LCD group all discontinued at 12 months; of 22 total participants taking Metformin, 3/10 in the LCD group discontinued the med; 1 person increased their dose. • MCD group: of ten total participants taking DPP-4 inhibitors, none of the 4 in the MCD discontinued at 12 months; of 22 total participants taking Metformin, 0/12 in the MCD group discontinued the med; 2 people decreased their dose.
Tay et al. (2015)	RCT comparing the effects of a LCD versus a high carbohydrate diet (HCD) on T2DM outcomes over 52 weeks.	<ul style="list-style-type: none"> • The LCD diet achieved a greater reduction in the antidiabetic medication effect score (MES) than did the HCD. • A greater proportion of LCD participants (52%) compared with HCD participants (21%) experienced a $\geq 20\%$ reduction in the antidiabetic MES.
Hallberg et al. (2019)	Comprehensive review of the American Diabetes Association guideline-recommended eating patterns.	<ul style="list-style-type: none"> • Of 11 studies cited, 8 reported more medication reductions and/or elimination of glycemic control medications in the LCD arm. • Five of six studies that conducted between-group comparisons of medication-use found the LCD to be superior. • Three of four 2-year studies reporting on diabetes medication-use found significant reductions with a LCD compared to a control diet.
Kempf et al. (2018)	RCT comparing changes in wt and HbA1c in a LCD vs MCD over 12 weeks vs 52 weeks.	<ul style="list-style-type: none"> • Both groups achieved improvements in HbA1c, wt, FBG, and BP by 12 weeks • The group that continued the LCD for 52 weeks showed a clinically relevant improvement in HbA1c of -0.81 compared to the group that completed the 12 week intervention.
Snorgaard et al. (2017)	Meta-analysis of RCTs comparing diets that consisted of LCD/MCD with HCD in individuals with T2DM measuring HbA1c, BMI, wt, LDL cholesterol, and quality of life.	<ul style="list-style-type: none"> • 2 out of 4 studies reported the lowest daily carb intake in LCD groups ranging from 57-58 grams and reduction in HbA1c. • Nutrition therapy with LCD/MCD induced a greater decline in HbA1c in participants with T2DM when compared to the HCD group. • LCD diets showed lower glycemic variability with reduced diabetes medication. • LCD may have a greater effect on glycemic control compared to HCD if participants adhere to their diet.
Dyson P. (2015)	RCTs comparing reduced carb intake and high carb intake in T2DM participants in measured outcomes of wt, HbA1c, and lipid concentration.	<ul style="list-style-type: none"> • All 8 studies reported weight loss in groups with reduce carbs with mean weight losses ranging from 1.7kg to 12kg, which were not significantly different from the control. • 3 studies reported reduction in HbA1c in the reduced carb group ranging from +0.1 to -2.0%. • Most studies reported reduction in lipid concentration in both reduced and high carb intake groups, with no significant differences.
Saslow et al. (2017)	32-week RCT evaluating the impact of an online intervention using a LCD and lifestyle changes on HbA1C.	<ul style="list-style-type: none"> • 6/11 participants (1 dropout) in the intervention group (55%) lowered their HbA1c to less than 6.5%. • Intervention group showed reduced wt and TG levels compared to control group. • None of the participants in the control group (0/8, 5 dropout) showed any improvement in HbA1c, wt or TGs.
Meng et al. (2017)	Meta-analysis of 9 RCTs compared glycemic, lipid & weight response to LCD vs HCD in adults with T2DM.	<ul style="list-style-type: none"> • 5/9 studies were considered high quality due to lack of blinding, withdrawals, dropouts. • Weight loss was significant on LCD only <12 months (-1.181), weight regain was observed after 6 months in several studies. • LCD improved HbA1c (-0.44%), TG (-0.33 mg/dL), & HDL-c (+0.07). • No significant differences in FPG, TC, LDL-c, weight loss after 12 months.

Summary

- Global rates of T2DM are on the rise and dietary habits play a big role in the management of T2DM.
- Recent studies show that participants with T2DM that were randomized to a LCD group were able to decrease or discontinue their glycemic medications at greater proportions when compared to participants in other dietary groups.
- Participants in a LCD group also had more documented decreases in their HbA1c and other glycemic markers.

Conclusions/Further Study

- The results show that a LCD may be advantageous for T2DM management.
- Moving forward, the goal from a clinical perspective is to translate these findings into clinical practice.
- When counseling patients about their T2DM, clinicians may use data on LCDs to help guide patients in evaluating their own diet, creating specific meal plans, utilizing appropriate online resources, and recognizing that a significant part of diabetes management is diet and other lifestyle factors.
- Education and clinical recommendations about a LCD can be tailored to the patient in terms of macronutrient distribution, while keeping goals, cultural considerations, socioeconomics and structural barriers in mind.

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