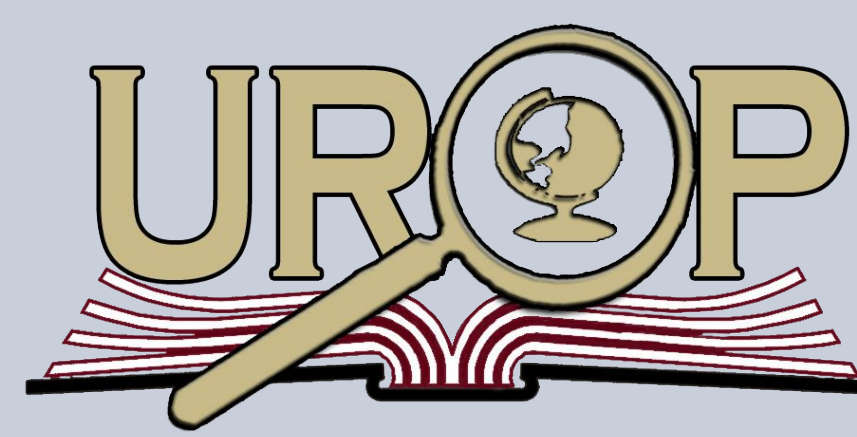




Nutrient Intake Associations with Lipid Profiles, Renal Function, and BMI in Overweight and Obese Subjects with Type 2 Diabetes Mellitus

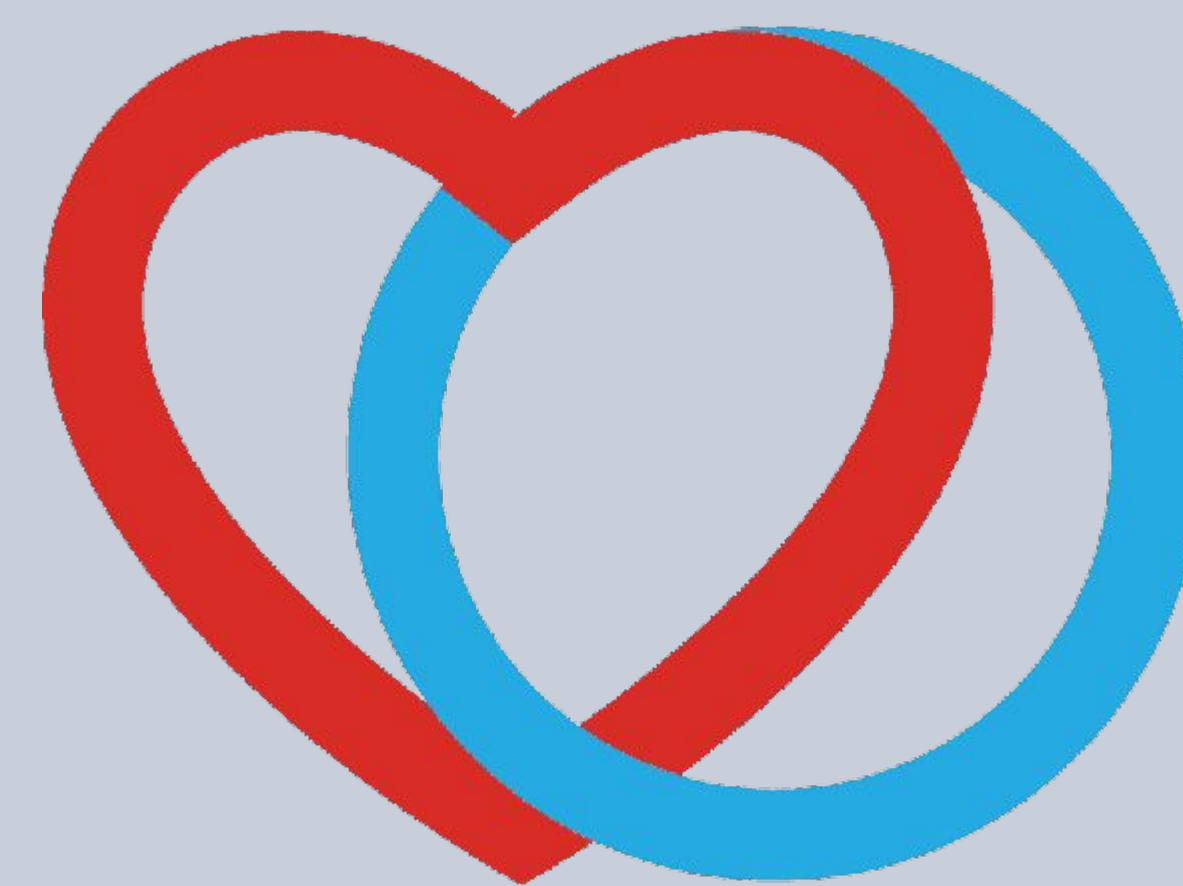


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Abstract

- The incidence of type 2 diabetes mellitus (T2D) continues to increase in the United States (U.S.), and is a major contributor of morbidity and mortality due to its increased associated risk of cardiovascular disease. Additionally, treatment of T2D and associated complications creates a large economic burden. Disturbances in lipid metabolism and renal function contributing to diabetic dyslipidemia and kidney disease can occur years prior to the development T2D and contributes to further adverse outcomes observed within this population. Diet plays an important role in the prevention and treatment of T2D, with particular emphasis placed on diet quality (e.g. rich in fiber, low in saturated fat) and overall intake (meeting essential macro- and micronutrients). Therefore, the objective of this study was to examine the relationship between dietary intake on lipid profiles, kidney function, and anthropometrics in overweight and obese men and women with T2D. Twenty overweight and obese (BMI 25-40 kg/m²) men and postmenopausal women between the ages of 45-80 years participated in this study. Three-day food records were used to assess dietary intake (Food Processor Software; ESHA Research, Salem, OR); the Piccolo Xpress Clinical Chemistry Analyzer was used to assess lipid profiles (LDL, HDL, CHOL, VLDL, TRIG) and renal function (ALB, BUN, Na⁺, Cl⁻, Ca, CRE, GLU, PHOS); and anthropometrics were assessed from participants' height, weight, waist, and hip circumferences. Pearson correlation coefficient was used for overall associations of all outcome variables, with significance accepted at ($P < 0.05$).



Results

- Twenty-four participants (n=11 females and n=13 males) who met the inclusion criteria were included in the study. Clinical, laboratory and statistical analyses were performed for the 24 participants and food records were analyzed for 7 of the participants who completed the study visit.
- Table 1 represents the characteristics of the participants enrolled for this cross-sectional study and table 2 represents dietary record analysis from three-day food records.
 - Results from Pearson Correlation indicated that fat-free mass had a significant positive association (0.768; $P < 0.05$) with total participant reported carbohydrate intake, while fat mass had a significant negative association (-0.770; $P < 0.05$) with total participant reported carbohydrate intake.
- Participants waist circumference had significant negative associations (-0.774, -0.817; $P < 0.05$) with total participant reported protein and fat reported intake, respectively. Total reported kilocalorie intake had significant positive associations (0.937; $P < 0.01$; 0.861; $P < 0.05$) with total participant reported fat and protein intake, respectively. Additionally, total reported protein intake had a strong positive association (0.872; $P < 0.05$) with total saturated fat intake.

Research Prospectus

- The incidence of type 2 diabetes mellitus (T2D) continues to increase in the U.S., with over 30 million Americans (over 9% of the population) having this chronic disease. As the seventh leading cause of death in the U.S., diabetes is a major contributor of morbidity and mortality due to the associated risk of cardiovascular disease (CVD).
- Increases in body weight have contributed to the increased prevalence of T2D in the U.S.; many individuals with T2D are not aware of having the disease until symptoms develop. Additionally, treatment of T2D and associated complications creates a large economic burden.
 - Lifestyle modifications including one's diet plays an important role in the prevention and treatment of T2D, with particular emphasis placed on diet quality (e.g. rich in fiber, low in saturated fat) and overall intake (meeting essential macro-and micronutrients). Yet, further studies are needed to establish the associated benefits of macro-and micronutrients with various health outcomes observed in T2D.
- Therefore, the objective of this cross-sectional study was to examine the relationship between dietary intake on lipid profiles, kidney function, and anthropometrics in overweight and obese men and women with T2D.

Subject Characteristics:	Participants (N=24)
Male/Female (n/n)	13/11
Age (years)	65±2.0
Height (cm)	170.1±2.3
Weight (kg)	91.2±3.2
BMI (kg/m ²)	31.5±0.8
Fat Free Mass (%)	65.8±1.6
Fat Mass (%)	34.3±1.6
Blood Glucose (mg/dL)	141.2±6.4
Waist Circumference (cm)	110.1±2.5
Hip Circumference (cm)	112.5±1.7
Waist-to-Hip Ratio	0.98±0.02
Systolic Blood Pressure (mmHg)	138.9±4.9
Diastolic Blood Pressure (mmHg)	80.1±2.6
Heart Rate (bpm)	71.2±2.2

Table 1. Subject characteristics including anthropometrics, body composition, blood pressure, and glucose values are reported as mean±SEM.

Dietary Records:	Participants (N=7)
Total Kilocalories	2072±169
Total Protein (g)	83.6±6.4
Total Carbohydrate (g)	222.6±17.9
Total Fiber (g)	12.8±2.7
Total Sugar (g)	94.9±13.0
Total Saturated Fat (g)	31.2±4.4
Total Fat (g)	95±12.0

Table 2. Nutrient intake from three-day food record values reported as mean±SEM.

Discussion

- Findings of this study suggested that higher carbohydrate intake was associated with favorable outcomes associated with body composition including higher lean mass and lower fat mass. This finding further exemplifies the importance of sufficient carbohydrate intake (with the average reported of 222.6 grams reported) and how lower carbohydrate diets may be associated with less favorable body composition for individuals with T2D.
- Individuals in this study who consumed higher fat and protein intake were associated with a lower waist circumference, indicating the importance of consuming adequate macronutrients (with the average reported of 83.6 and 95 grams reported total for protein and fat intake, respectively) for favorable anthropometrics in type-2 diabetics.
- Due to fat having the greatest energy yield per gram, it was expected that greater reported total fat intake was associated with a greater kilocalorie intake. An unanticipated finding was finding positive associations between total protein intake and total kilocalorie intake, indicating that the more calories consumed not only came from higher fat but also protein intake.
- Total protein intake was positively associated with total saturated fat intake, indicating that participants in this study may have consumed not as lean or healthy sources of protein as saturated fat comes from animal sources (such as meats and cheeses) as well as processed foods.
- Further clinical studies are needed to further assess the effects of diet in populations with T2D with regards to cardiometabolic outcomes.

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Step 1

- To assess participant eligibility, To assess participant eligibility, measurement of fasting blood glucose levels, anthropometrics and questionnaires for medical history/medication use were used
- Once eligible, participants were given a three-day food record to take home and bring back prior to the study visit.

Step 2

- During the study visit, after an overnight fast, participant's blood was drawn for assessment of indices of their lipid panels (nd renal function using the Piccolo Xpress Clinical Chemistry Analyzer
 - Blood pressure and anthropometrics were also assessed at the study visit

Step 3

- Food records were assessed via three-day food records using the Food Processor Software for the following: carbohydrates, fat, protein, dietary fiber, sugar, saturated fat, mono/poly unsaturated fats, cholesterol, and various micronutrients of interest)
- Pearson correlation coefficient was used for overall associations of all outcome variables, with significance accepted at ($P < 0.05$).