Association Between Dietary Nutrient Intake and Periodontitis: A Cross-Sectional Study of NHANES 2009-2014

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Background

- **Periodontitis**: Chronic inflammatory disease destroying tooth-supporting tissues.
- **Prevalence**: Affects nearly half of U.S. adults aged 30+.
- **Risk Factors**:
  - Established: Smoking, Diabetes, Poor Oral Hygiene.
  - Emerging: Diet and Nutrition.
- **Dietary Hypothesis**:
  - Pro-inflammatory: Added sugars.
  - Anti-inflammatory: Fiber, Antioxidants (Vit C), Bone-supporting nutrients (Calcium).

Objectives

To investigate the independent association between specific dietary nutrient intakes and the prevalence of moderate-to-severe periodontitis in U.S. adults.

Key Nutrients Analyzed

- Total Sugars (g/day)
- Dietary Fiber (g/day)
- Vitamin C (mg/day)
- Calcium (mg/day)

Methods: Design and Population

- **Data Source**: NHANES 2009-2014 (3 cycles).
- **Design**: Cross-sectional, nationally representative.
- **Inclusion Criteria**:
  - Age $\geq$ 30 years.
  - Completed full-mouth periodontal examination.
  - Valid Day 1 dietary recall data.
- **Exclusions**: Edentulous, pregnant, missing covariates.
- **Final Sample Size**: N = 8,006.

Methods: Variables

- **Outcome**: Periodontitis (CDC/AAP Definitions)
  - Dichotomized: **Moderate/Severe** vs. **None/Mild**.
- **Exposures**: Continuous dietary intake from 24h recall.
- **Covariates**:
  - **Demographics**: Age, Sex, Race/Ethnicity, Education, PIR.
  - **Behaviors**: Smoking, Alcohol, Physical Activity, Flossing.
  - **Clinical**: BMI, Diabetes, Number of Teeth.
  - **Dietary**: Total Energy Intake (kcal).

Methods: Analysis

- **Software**: Python (pandas, statsmodels).
- **Weighting**: 6-year exam weights (‘WTMEC6YR‘) to account for complex survey design.
- **Statistical Tests**:
  - Descriptive: Weighted means and frequencies.
  - Modeling: Multivariable Logistic Regression.
- **Models**:
  - Model 1: Unadjusted.
  - Model 2: Adjusted for Demographics + Energy.
  - Model 3: Fully Adjusted (Health behaviors, SES, Clinical).

Results: Participant Flow

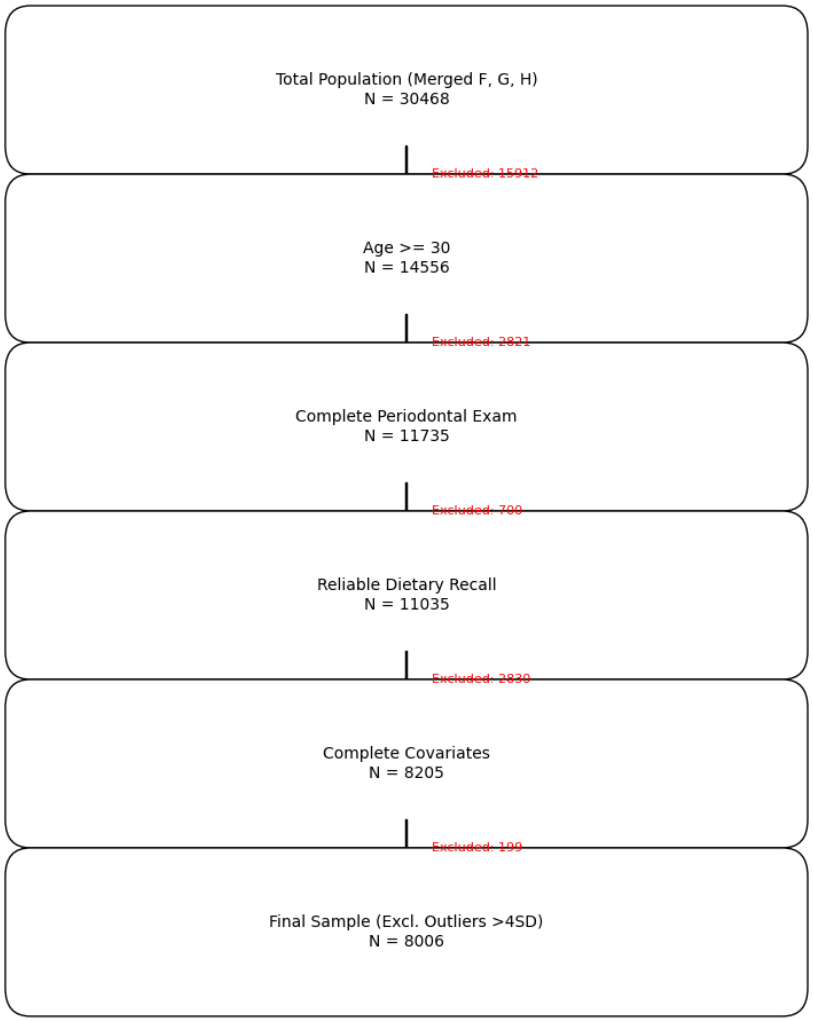

Figure: STROBE Flow Diagram

Results: Population Characteristics

Comparison: Periodontitis vs. Healthy

- **Demographics**: Periodontitis group was older (53.8 vs 44.7 y) and had lower SES.
- **Behaviors**: Higher smoking rates (20.1% vs 9.1%).
- **Unadjusted Dietary Intake**:

Nutrient	No/Mild Perio	Mod/Severe Perio
Fiber (g)	19.0	16.9
Vitamin C (mg)	82.9	75.1
Calcium (mg)	1045	928

All differences p ¡ 0.001 (unadjusted).

Results: Multivariable Regression

Association with Moderate/Severe Periodontitis (Fully Adjusted)

Nutrient	OR (95% CI)	P-value	Interpretation
Dietary Fiber	**0.99 (0.99-0.99)**	**¡0.001**	**Protective**
Total Sugars	1.00 (1.00-1.00)	¡0.001	Null
Vitamin C	1.00 (1.00-1.00)	¡0.001	Null
Calcium	1.00 (1.00-1.00)	¡0.001	Null

Note: OR is per unit change (1g or 1mg). Fiber OR of 0.99 implies $\sim$1% risk reduction per gram.

Discussion

- **Fiber**: Consistent with literature.
  - Mechanism: Prebiotic effect, glycemic control, reduced systemic inflammation.
  - A 10g increase in daily fiber could reduce risk by $\sim$10%.
- **Sugars**: No independent association for *Total Sugars*.
  - Distinction between intrinsic (fruit) vs. added sugars is key.
- **Micronutrients**: No independent effect after adjustment.
  - Effects likely confounded by overall diet quality and smoking.

Strengths and Limitations

Strengths

- Large, nationally representative sample.
- Gold-standard periodontal exams.
- Comprehensive covariate adjustment.

Limitations

- Cross-sectional (no causality).
- Single 24h recall (measurement error).
- Residual confounding (genetics, microbiome).

Conclusion

Take-Home Message

Dietary fiber intake is independently and inversely associated with periodontitis in U.S. adults.

- Increasing fiber intake may be a simple, effective adjunct strategy for periodontal health.
- Future research should focus on longitudinal designs and "added sugars".

Thank You

Questions?