United States
Network of
PEDIATRIC MULTIPLE SCLEROSIS
Centers

A case-control study of dietary salt intake and risk of pediatric multiple sclerosis (MS)

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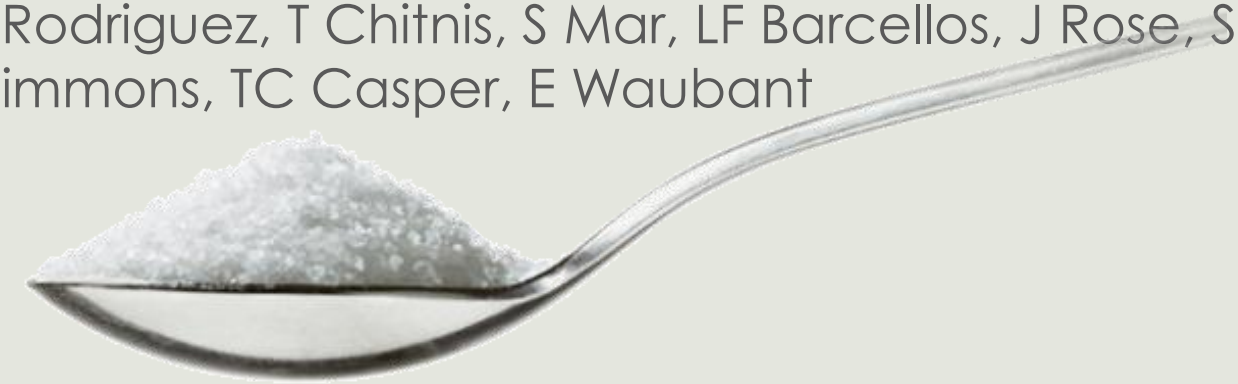

Disclosures

- Authors have no disclosures relevant to this work.

Background

- Limited research on dietary salt and MS
  - Association between salt intake and disease activity
  - Link between high salt and disease onset and progression in animal model
  - Salt proposed to enhance pro-inflammatory pathways
- Pediatric-onset MS offers opportunity to study nutritional risk factors close to disease onset

Farez 2014, Wu 2013, Kleinewietfelt 2013

Objective

- To determine whether **dietary salt intake** is associated with **pediatric-onset MS**

Methods

- **Multicenter, case-control design**
  - 14 US pediatric MS centers (Nov. 2011-Jun. 2014)
  - Collaborative investigation on environmental and genetic factors in children with MS (R01NS071463, PI Waubant)
  - Each center collected:
    - Demographics
    - Environmental exposures
    - Medical history

Methods, *cont.*

- **Study participants**
  - **Cases**
    - Children with CIS with at least 2 silent T2 lesions or RRMS based on McDonald criteria
    - Onset < 18 years of age, < 4 years duration
  - **Controls**
    - Recruited at same participating centers
    - < 20 years of age
    - Exclusion criteria:
      - No history of autoimmune disorders (except eczema and asthma)
      - No history of immunosuppressive therapy
      - Parental MS

Polman 2011

Methods, *cont.*

- **Blocks Kids Food Screener**
  - Children 2-17 YO (English/Spanish), 10-12 minutes to complete
  - Self-report, validated dietary screener
  - Subjects select frequency and portion of food consumed in the previous week
  - 41 questions including:
    - Fruits/fruit juices, vegetables
    - Processed foods, including French fries
    - Meat, poultry, fish, whole grains, dairy, legumes

NutritionQuest 2007, Hunsberger 2012

Statistical Analyses

- Sodium intake was compared between cases and controls
  - Continuous variable
  - Categorical variable based on excess sodium
  - Terciles
- Logistic regression models adjusted for:
  - Age
  - Gender
  - Body mass index (BMI)
  - Ethnicity
  - Socioeconomic status (SES)

Results, *baseline characteristics*

	Cases N=174	Controls N=337	All N=511	P-value
Age (mean +/- SD)	15.2 (3.4)	13.9 (3.7)	14.4 (3.6)	<.01
BMI (kg/m^2)	25.1 (6.5)	22.0 (5.9)	23.0 (6.3)	<.01
Energy (kcal/day)	1322 (602)	1315 (631)	1371 (620)	0.85
Total fat (g/day)	53.8 (28.4)	53.6 (28.5)	53.6 (28.4)	0.99
Gender				<.01
Female	110 (63%)	164 (49%)	274 (54%)	
Race				0.09
White	101 (58%)	230 (68%)	331 (65%)	
Ethnicity				<.01
Hispanic or Latino	51 (29%)	59 (18%)	110 (22%)	
Mother's highest degree				<.01
None	22 (13%)	17 (5%)	39 (8%)	
High school, associates	96 (55%)	138 (41%)	234 (46%)	
Bachelor's, graduate	50 (30%	143 (42%)	193 (38%)	
Other	0 (0%)	12 (4%)	12 (2%)	

Results, *dietary sodium intake*

	Gender	Cases	Controls	All	P-value
Sodium (mg/day ± SD)	All	2025 (1096)	2007 (1094)	2013 (1094)	0.98
	Male	2496 (1242)	2327 (1290)	2373 (1277)	0.27
	Female	1751 (899)	1668 (697)	1701 (784)	0.77

Results, *dietary sodium intake*

	Gender	Cases	Controls	All	P-value
Excess sodium (%)	All	64	68	67	0.34
	Male	81	77	78	0.53
	Female	54	58	56	0.48

- No difference in proportion of cases vs. controls who consumed excess sodium
- Excess sodium defined by adequate intake:
  - 1000 mg/d (1-3 YO)
  - 1200 mg/d (4-8 YO)
  - 1500 mg/d (9-19 YO)

Institute of Medicine, Dietary Reference Intakes

Results, *dietary sodium intake*

Sodium terciles	Gender	Cases	Controls	All
1st	All	36%	32%	33%
	Male	22%	23%	23%
	Female	44%	41%	42%
2nd	All	31%	35%	33%
	Male	27%	29%	28%
	Female	34%	41%	38%
3rd	All	33%	33%	33%
	Male	52%	48%	49%
	Female	23%	18%	20%

- No difference in proportion of cases versus controls in each tercile (p=0.63)
- No relationship between tercile and case-control status for males (p=0.88) or females (p=0.40)

Results, *multivariable analyses*

	OR	95% CI	P-value
Sodium (100 mg/day)	1.00	(0.98, 1.02)	0.79
Excess sodium	1.06	(0.68, 1.67)	0.79
Log (sodium)	1.11	(0.71, 1.73)	0.64
Sodium terciles			
2nd versus 1st	0.97	(0.58, 1.62)	0.90
3rd versus 1st	1.15	(0.67, 1.98)	0.60

- Adjusted for age, gender, BMI, ethnicity, SES

Discussion

- **Strengths**
  - Case-control design with large catchment area, diverse patient population
  - Foods high in sodium included in dietary screener
  - Multivariable analyses adjusted for factors associated with both MS risk and diet
- **Limitations**
  - Self-report assessment can be limited by subject recall and foods listed on screener
  - Dietary patterns may have changed since diagnosis

Conclusions

- No difference in dietary salt intake was found between cases and controls in unadjusted analyses and multivariable regression models
- If confirmed, dietary salt intake may not play a large role in pediatric MS susceptibility
- **Future Direction**
  - Salt associated with MS risk in sub-group with specific genotypes or unidentified risk factors?
  - Salt associated with relapse rate or disease activity?

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