Severe Feeding Problems and Gastrointestinal Symptoms in Children with Autism Spectrum Disorder

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Learning Objectives

• Describe feeding concerns in ASD
• Identify medical outcomes and nutrition issues associated with atypical patterns of intake
• Recognize possible contributing factors, focusing on evidence of GI concerns in ASD
• Provide guidance regarding clinical and research practices based on the extant literature
Disclosures

- Autism Research Institute
  - Expert Panel on GI concerns in ASD
- Nutricia: Advanced Medical Nutrition
  - Consultant: GI symptoms in ASD
Autism Spectrum Disorder (ASD)

• DSM – 5:

Neurodevelopmental disorder(s) of unknown genetic origin where symptoms unfold over the first few years of life:

   – *Persistent deficits in social communication and social interaction*
   
   – *Restrictive, repetitive patterns of behavior, interests, or activities*
Pediatric Feeding Disorders

• Chronic feeding concerns generally involve either:
  – 1) Volume - Food Refusal
  – 2) Variety - Food Selectivity

• Affect ~ 5% of children (Lukens & Silverman, 2014)

Severe problem behaviors during meals:
  – Crying
  – Disruptions
  – Elopement
  – Aggression
  – Spitting
  – Expulsion
Typical Dietary Fluctuations

• *Common problem* for children and *source of stress* for caregivers:
  – Up to 40% of children experience some mealtime problems (Manikam & Perman, 2000; Mayes & Volkmar, 1993)
  – Sharp estimate: 100%

• *Issues include*:
  • “Picky” eating patterns
  • Strong food preferences – insist on eating the same foods
  • Behaviors aimed at ending meals prematurely
  • Fluctuating hunger
  • Reluctance to self-feed
Volume: Associated Factors

• Medical Issues:
  ▪ Congenital or acquired respiratory, cardiac, and gastrointestinal problems, which cause difficult or painful eating experiences

• These include:
  ▪ Gastroesophageal reflux
  ▪ Food allergies
  ▪ Gastroenteritis
  ▪ Dysmotility
  ▪ Prematurity (with intubation)
  ▪ Bronchopulmonary dysplasia
  ▪ Short bowel syndrome
  ▪ Lactose intolerance

• Feeding problems occurs in 40-70% of children with chronic medical conditions (Lukens & Silverman, 2014)
Variety: Associated Factors

- Autism Spectrum Disorder (ASD)
Historical Background


• "Food is the earliest intrusion that is brought to the child from the outside world."
Research Support

• Ledford & Gast (2006)
  – Most comprehensive summary at the time
  – 7 descriptive studies identified
  – N = 381 children with ASD

• Estimates ranged from 46% and 89% of children with ASD displaying significant feeding problems
  – Often no identifiable organic precursor
Research Support

• Limitations
  – No control group and mostly descriptive studies
  – Involved biased clinical sample – e.g., feeding disorders clinic
  – Lack of uniformity definition of feeding problem
Inclusion criteria:
1. Published between 1980 and 2011
2. Focused on pediatric population (birth to 18 years)
3. Involved a comparison group
4. Evaluated feeding and/or nutrition in ASD a standardized, replicable manner
5. Presented data either descriptively (e.g., frequency, percentages) or statistically (e.g., t scores)

Exclusion criteria:
1. Studies with known sampling bias (e.g., chart reviews from feeding programs)
2. Studies focusing on dietary manipulation (e.g., GFCF)
Final Sample

- 881 children with ASD
- 13,544 comparison children
  - Typically developing (TD)
  - Siblings (SB)
  - Other developmental concerns (DD)
Fivefold increase in the odds of having a feeding problem in ASD

**Food Selectivity**
Preference - carbohydrates, snacks, fats, and/or processed food
Rejection - fruits and vegetables

Bandini et al. (2010)  
**n = 53**  
**n = 53**  
ASD group refused more **vegetables**, both in absolute amount (11 +/- 6 vs 6 +/- 5; p < .0001) and as a percentage of foods offered (63% +/- 31% vs 33% +/- 27%; p < .0001).

Emond et al. (2010)  
**n = 79**  
**n = 12,901**  
ASD group consumed fewer **vegetables**, salads, and **fresh fruit** but also consumed fewer sweets and fizzy drinks.

Johnson et al. (2008)  
**n = 19**  
**n = 20**  
ASD group consumed significantly fewer **vegetables** (p < .001).

Luckens & Linsheid (2008)  
**n = 68**  
**n = 40**  
ASD group had significantly higher scores on a scale assessing limited dietary variety (p < .01), which was negatively associated with servings of **meats** (p < .01), **fruits** (p < .05), and **vegetables** (p < .01).

Martins et al. (2008)  
**n = 41**  
**n = 41**  
ASD group displayed significantly more food avoidance behaviors (p < .01), with **vegetables** followed by **fruits** the most commonly avoided food types.

Schmitt et al. (2008)  
**n = 20**  
**n = 18**  
Significantly more children with ASD choose food based on texture (70% vs. 11%; p < .05), with favorite foods in ASD including **pizza, pasta, and cookies/candy**. All children in the ASD avoided mushy foods.
<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Number of contributing studies</th>
<th>Random effects model</th>
<th>95% confidence limits</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SMD (SE)</td>
<td>OR</td>
<td>LCL</td>
</tr>
<tr>
<td>Calcium</td>
<td>8</td>
<td>-0.65 (0.29)</td>
<td>0.31</td>
<td>0.11</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>7</td>
<td>-0.02 (0.07)</td>
<td>0.97</td>
<td>0.76</td>
</tr>
<tr>
<td>Energy</td>
<td>6</td>
<td>0 (0.06)</td>
<td>0.99</td>
<td>0.80</td>
</tr>
<tr>
<td>Fiber</td>
<td>6</td>
<td>0.09 (0.12)</td>
<td>1.18</td>
<td>0.77</td>
</tr>
<tr>
<td>Iron</td>
<td>7</td>
<td>0.17 (0.20)</td>
<td>1.35</td>
<td>0.66</td>
</tr>
<tr>
<td>Protein</td>
<td>7</td>
<td>-0.58 (0.25)</td>
<td>0.35</td>
<td>0.14</td>
</tr>
<tr>
<td>Total fat</td>
<td>6</td>
<td>0.03 (0.06)</td>
<td>1.05</td>
<td>0.84</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>6</td>
<td>-0.51 (0.35)</td>
<td>0.39</td>
<td>0.11</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>7</td>
<td>-0.13 (0.19)</td>
<td>0.98</td>
<td>0.52</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>6</td>
<td>-0.07 (0.19)</td>
<td>0.88</td>
<td>0.45</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>5</td>
<td>0.05 (0.17)</td>
<td>1.10</td>
<td>0.61</td>
</tr>
<tr>
<td>Zinc</td>
<td>6</td>
<td>-0.03 (0.09)</td>
<td>0.95</td>
<td>0.69</td>
</tr>
</tbody>
</table>

Daily Living and Quality of Life

- Increased parental stress regarding health and development
- Reduced opportunities to eat at restaurants or social occasions
- Disrupted family meals & further limitations in social interactions
- Required to prepare multiple menus for each meal
Mothers’ Challenges in Feeding their Children with Autism Spectrum Disorder—Managing More Than Just Picky Eating

Laura G. Rogers · Joyce Magill-Evans · Gwen R. Rempel
Parent Report

• “I’m worried about his health. How can he stay alive eating two foods and drinking water?”
• “If you ever saw those meltdowns you wouldn’t want to offer non-preferred food either.”
• “He’ll gag and almost get physically sick just watching us eat something like spaghetti and meat sauce.”
• “My younger children won’t eat the food they don’t like, but my son with autism won’t even come to the table.”
Gastrointestinal Symptoms in Autism Spectrum Disorder: A Meta-analysis
Barbara O. McElhanon, Courtney McCracken, Saul Karpen and William G. Sharp
Pediatrics; originally published online April 28, 2014;
DOI: 10.1542/peds.2013-3995
Inclusion criteria:
1. Published between 1980 and 2012
2. Focused on pediatric population (birth to 18 years)
3. Involved a comparison group
4. Evaluated GI concerns in ASD in a standardized, replicable manner
5. Presented data either descriptively (e.g., frequency, percentages) or statistically (e.g., t scores)

Exclusion criteria:
1. Studies with known sampling bias (e.g., chart reviews from GI clinics)
2. Studies using a healthy control group (i.e., screening out children with known gut issues)
<table>
<thead>
<tr>
<th><strong>TABLE 1</strong> ASD and GI Key Words Used in Database Search</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASD Search Terms</strong></td>
</tr>
<tr>
<td>Asperger's</td>
</tr>
<tr>
<td>Autism</td>
</tr>
<tr>
<td>Autism spectrum disorder</td>
</tr>
<tr>
<td>Autistic</td>
</tr>
<tr>
<td>Pervasive developmental disorder</td>
</tr>
<tr>
<td>PDD-NOS</td>
</tr>
<tr>
<td><strong>GI Search Terms</strong></td>
</tr>
<tr>
<td>Abdominal pain/abdomen</td>
</tr>
<tr>
<td>Celiac</td>
</tr>
<tr>
<td>Colitis</td>
</tr>
<tr>
<td>Constipation</td>
</tr>
<tr>
<td>Diarrhea</td>
</tr>
<tr>
<td>Digestion</td>
</tr>
<tr>
<td>Digestive disorders/system</td>
</tr>
<tr>
<td>Disaccharidase</td>
</tr>
<tr>
<td>Endoscopy/colonoscopy</td>
</tr>
<tr>
<td>Esophagitis/oesophagitis</td>
</tr>
<tr>
<td>Gastroenterology</td>
</tr>
<tr>
<td>Gastritis</td>
</tr>
<tr>
<td>Gastrointestinal</td>
</tr>
<tr>
<td>Gluten(s)</td>
</tr>
<tr>
<td>Gastroesophageal reflux</td>
</tr>
<tr>
<td>Intestines/intestinal</td>
</tr>
<tr>
<td>Vomiting</td>
</tr>
</tbody>
</table>

PDD-NOS, pervasive developmental disorder not otherwise specified.
Final Sample

- 2215 children with ASD
- 50,644 typically developing peers
<table>
<thead>
<tr>
<th>GI Symptom</th>
<th>Number of Contributing Studies</th>
<th>Random Effects Model</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SMD (SE)</td>
<td>Odds Ratio</td>
<td>95% Confidence Limits</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>General GI concerns</td>
<td>10</td>
<td>0.91 (0.23)</td>
<td>5.25</td>
<td>2.34</td>
<td>11.75</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>12</td>
<td>0.71 (0.19)</td>
<td>3.63</td>
<td>1.82</td>
<td>7.23</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Constipation</td>
<td>9</td>
<td>0.75 (0.16)</td>
<td>3.86</td>
<td>2.23</td>
<td>6.71</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>8</td>
<td>0.49 (0.20)</td>
<td>2.45</td>
<td>1.19</td>
<td>5.07</td>
<td>.016</td>
</tr>
</tbody>
</table>

Other key findings

- Insufficient data to analyze data on other GI concerns, such as reflux or EOE, often link with organic pathology.

- Although organic factors leading to difficult or painful eating, such as gastroesophageal reflux, gastroenteritis, and food allergies, often precipitate or play a role in the development of chronic feeding concerns in other pediatric populations, research has yet to identify a clear GI link to account for the emergence, maintenance, and topography of feeding problems associated with ASD.
Call for greater clinical scrutiny

Evaluation, Diagnosis, and Treatment of Gastrointestinal Disorders in Individuals With ASDs: A Consensus Report

authors: Timothy Buie, MD, a,b,c Daniel B. Campbell, PhD, d George J. Fuchs, III, MD, e Glenn T. Furuta, MD, f,g Joseph Levy, MD, h Judy Van de Water, PhD, i Agnes H. Whitaker, MD, j Dan Atkins, MD, k,l Margaret L. Bauman, MD, b,m,n Arthur L. Beaudet, MD, o Edward G. Carr, PhD, p Michael D. Gershon, MD, q Susan L. Hyman, MD, r Pipop Jirapinyo, MD, s Harumi Jyonouchi, MD, t Koorosh Kooros, MD, u Rafail Kushak, PhD, DrSc, a,m Pat Levitt, PhD, v Susan E. Levy, MD, w Jeffery D. Lewis, MD, x Katherine F. Murray, BSN, RN, c Marvin R. Natowicz, MD, PhD, y Aderbal Sabra, MD, PhD, z Barry K. Wershil, MD, aa Sharon C. Weston, MS, RD, LDN, bb Lonnie Zeltzer, MD, cc and Harland Winter, MD a,c

abstract

Autism spectrum disorders (ASDs) are common and clinically heterogeneous neurodevelopmental disorders. Gastrointestinal disorders and associated symptoms are commonly reported in individuals with ASDs, but key issues such as the prevalence and best treatment of these conditions are incompletely understood. A central difficulty in recognizing and characterizing gastrointestinal dysfunction with ASDs is the communication difficulties experienced by many affected individuals. A multidisciplinary panel reviewed the medical literature with the
Buie et al. (2010)

• All of the common gastrointestinal conditions encountered by individuals with typical neurologic development are also present in individuals with ASDs.

• The communication impairments characteristic of ASDs may lead to unusual presentations of gastrointestinal disorders, including sleep disturbances and problem behaviors.

• Caregivers and health care professionals should be alert to the presentation of atypical signs of common gastrointestinal disorders in patients with ASDs.
Call for greater research scrutiny

The Gut Microbiome: A New Frontier in Autism Research

Jennifer G. Mulle • William G. Sharp • Joseph F. Cubells
Modify our clinical practice

Figure 2. Algorithm for nutrition management of gastrointestinal concerns in children with autism spectrum disorder.
A Retrospective Chart Review of Dietary Diversity and Feeding Behavior of Children With Autism Spectrum Disorder Before and After Admission to a Day-Treatment Program

William G. Sharp,¹,² David L. Jaquess,¹,² Jane F. Morton,¹,² and Aida G. Miles³

Treatment Outcomes for Severe Feeding Problems in Children With Autism Spectrum Disorder

Rinita B. Laud,¹ Peter A. Girolami,² James H. Boscoe,¹ and Charles S. Gulotta²
What about dietary intervention in ASD?

- Parent-initiated interventions
  - Target improving core autism symptoms in ASD vs. overall nutrition and health
- At this time, there is no evidence supporting the use of diet as a primary treatment of ASD
<table>
<thead>
<tr>
<th>Diet</th>
<th>Foods restricted</th>
</tr>
</thead>
</table>
| Elimination diets/elemental diet\(^{22,23}\)   | Elimination diet (6 foods): milk, egg, wheat, soy, peanuts/tree nuts, fish/shellfish  
Elemental: all foods except an amino acid—based formula |
| Fermentable oligo-di-mono saccharides and polyols\(^{24,25}\) | Foods containing fructose (eg, fruit, high-fructose corn syrup), lactose (eg, cow’s milk dairy), fructans (eg, wheat, onion, garlic), galactans (eg, legumes), and polyols (eg, sorbitol, cherries, avocados) |
| Food coloring/food additives avoidance\(^{26,27}\) | Foods that contain food color additives (food dye)                                |
| Gluten-free, casein-free\(^{28-30}\)           | Foods containing gluten (eg, bread, pasta) and casein (eg, cow’s milk, yogurt)    |
| Ketogenic diet or modified Atkins diet\(^{31,32}\) | Carbohydrate-rich foods, including sugar                                          |
| Specific carbohydrate diet\(^{29,33,34}\)      | Cereal grains (eg, wheat, oats, rice), processed meats (eg, lunch meats, hot dogs), canned vegetables, canned fruits, most fruit juices, soy beans, chick peas, bean sprouts, mung beans, fava beans, yogurt, milk, processed cheese, tubers (eg, potatoes, yams), curry, onion powder, garlic powder |

**Figure 1.** Possible caregiver-initiated restrictions in autism spectrum disorder (in alphabetical order).
Danger of Use

• May increase risk of nutritional deficiencies
  – Diet likely already compromised
• May involve removing preferred foods
  – Further restricting a child’s diet
• May contaminate previously preferred food
  – Milk to soy milk
Sharp “Take home message” re: Diet and Autism

• Diet does not cause. Diet does not cure autism. But.....

• Improving diet may enhance GI functioning and overall health as well as reduce related behavioral symptoms.

• Parents should not feel obligated to place children on these diets unless medically indicated

  — Clinicians can give permission not to pursue