

# Gastrointestinal Symptoms in Children with Autism Spectrum Disorder: Clinical Characteristics, Contributing Factors and Management Strategies

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**Abstract:** *Gastrointestinal (GI) symptoms are common comorbid conditions in children with autism spectrum disorder (ASD), including constipation, abdominal pain, diarrhea, abdominal distension, and gastroesophageal reflux. These symptoms may affect dietary intake, nutritional status, growth, sleep, and quality of life. Due to limited communication abilities, some children with ASD may have difficulty expressing gastrointestinal discomfort and may instead present with food refusal, crying, sleep disturbance, or behavioral changes, increasing challenges in clinical recognition. The development of GI symptoms in children with ASD is likely associated with multiple factors, including food selectivity, dietary patterns, bowel habits, sensory characteristics, psychological stress, medication use, and alterations in gut microbiota. However, current evidence is mainly derived from observational studies, and causal relationships remain unclear. Microbiome studies are also influenced by confounding factors such as diet, age, constipation, and medication exposure, and no validated biomarkers are currently available for clinical diagnosis or treatment monitoring. Clinical assessment should follow general pediatric gastrointestinal principles, including detailed history taking, physical examination, and identification of alarm features, while incorporating ASD-related characteristics such as communication abilities, sensory responses, feeding behaviors, and toileting patterns. Management should focus on specific gastrointestinal disorders and include appropriate nutritional and behavioral interventions when indicated. Evidence supporting probiotics, prebiotics, restrictive diets, and fecal microbiota transplantation remains limited, and these approaches should not replace standard clinical evaluation and treatment. This review summarizes the clinical characteristics, contributing factors, assessment approaches, and management strategies of GI symptoms in children with ASD, providing a reference for clinical recognition and individualized management.*

**Keywords:** Gastrointestinal Symptoms, Autism Spectrum Disorder, Clinical Characteristics, Contributing Factors, Management Strategies.

## 1. Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by persistent difficulties in social communication and interaction, together with restricted and repetitive patterns of behaviors, interests, or activities [1]. Beyond core symptoms, children with ASD frequently experience comorbid conditions, including sleep problems, anxiety, feeding difficulties, and gastrointestinal (GI) symptoms. Common GI manifestations include constipation, abdominal pain, diarrhea, abdominal distension, and gastroesophageal reflux; however, reported prevalence varies considerably across studies due to differences in populations, symptom definitions, assessment methods, and potential confounding factors [2-4].

GI symptoms may adversely affect dietary intake, nutritional status, growth, sleep, and quality of life in children with ASD. In addition, gastrointestinal discomfort may present as food refusal, irritability, sleep disruption, or behavioral changes, particularly among children with limited verbal communication abilities. These behaviors are nonspecific and should not be interpreted as direct indicators of gastrointestinal disease or attributed solely to ASD. Comprehensive evaluation incorporating medical history, physical examination, caregiver reports, and symptom monitoring is essential for identifying potential gastrointestinal disorders [5-10].

The occurrence of GI symptoms in children with ASD may involve multiple interacting factors, including feeding

behaviors, dietary patterns, bowel habits, sensory characteristics, psychological stress, medication exposure, and alterations in gut microbiota [11]. However, most available evidence is derived from observational studies, limiting conclusions regarding causality. Furthermore, microbiome research remains affected by factors such as diet, constipation, age, geographic variation, and medication use, and clinically applicable biomarkers remain unavailable.

This review aims to summarize the clinical characteristics, associated factors, assessment approaches, and management strategies of GI symptoms in children with ASD, with a focus on clinical recognition, nutritional risk, and individualized intervention.

## 2. Literature Search and Narrative Review Approach

This narrative review focuses on the epidemiology, clinical manifestations, contributing factors, assessment, and management of gastrointestinal (GI) symptoms in children with autism spectrum disorder (ASD). Relevant clinical guidelines, expert consensus statements, systematic reviews, meta-analyses, randomized controlled trials, and representative observational studies were reviewed.

The literature selection prioritized studies involving children and adolescents, particularly those directly related to clinical recognition, diagnostic evaluation, and treatment strategies. For emerging areas with limited or inconsistent evidence, including gut microbiota interventions, restrictive diets, and

fecal microbiota transplantation, available evidence was evaluated with consideration of study design, sample size, potential confounding factors, outcome measures, and clinical applicability. No quantitative data synthesis was performed.

### 3. Epidemiological Characteristics and Clinical Manifestations

#### 3.1 Epidemiological Characteristics

A meta-analysis showed that, compared with typically developing children, children with ASD had higher odds of overall GI symptoms, constipation, diarrhea, and abdominal pain, with odds ratios of 4.42, 3.86, 3.63, and 2.45, respectively [2].

A systematic review and meta-analysis by Gan et al. [12] reported pooled prevalence rates of constipation, abdominal distension, abdominal pain, diarrhea, and vomiting in children and adolescents with ASD of approximately 37%, 23%, 21%, 19%, and 8%, respectively. Constipation appears to be one of the most frequently reported gastrointestinal problems in this population.

However, prevalence estimates vary considerably among studies, likely due to differences in participant characteristics, symptom definitions, assessment methods, and data sources [3-4]. Caregiver questionnaires may capture mild or transient symptoms, whereas clinical records may underestimate symptoms that do not lead to medical consultation. Therefore, current epidemiological findings primarily reflect the burden of GI symptoms rather than a direct causal relationship between ASD and gastrointestinal disorders.

#### 3.2 Clinical Manifestations

GI symptoms in children with ASD may involve both the upper and lower gastrointestinal tracts. Common manifestations include constipation, abdominal pain, abdominal distension, diarrhea, painful defecation, nausea, vomiting, and gastroesophageal reflux. Symptoms may occur individually or in combination, with considerable variation in severity, duration, and frequency. Persistent gastrointestinal discomfort may negatively affect eating, sleep, daily activities, and family quality of life [5-6].

Constipation is characterized by reduced stool frequency, hard stools, painful defecation, stool withholding, or fecal incontinence. Overflow fecal leakage caused by stool retention may occasionally be mistaken for diarrhea. Abdominal pain may be associated with meals, bowel movements, or emotional changes, whereas diarrhea and vomiting require assessment of symptom duration, infection exposure, dietary factors, and medication history.

Because some children with ASD have limited communication abilities, gastrointestinal discomfort may be expressed through nonspecific behaviors, including food refusal, crying, sleep disturbance, abdominal pressing, toileting avoidance, self-injurious behaviors, or aggression [8-10]. These behaviors should not be considered diagnostic of gastrointestinal disorders but should prompt further clinical

evaluation when new or worsening symptoms occur.

### 4. Feeding Problems and Their Relationship with Gastrointestinal Symptoms

Feeding problems are frequently observed in children with autism spectrum disorder (ASD), including food selectivity, food refusal, avoidance of novel foods, and strong preferences for specific textures, tastes, smells, colors, or brands. Sensory sensitivities, repetitive behaviors, dependence on routines, and communication difficulties may contribute to restricted eating patterns and reduced acceptance of diverse foods.

Persistent food selectivity may result in limited dietary variety and reduced intake of fiber-rich foods, fruits, vegetables, and whole grains, thereby increasing the risk of inadequate intake of fluids, vitamins, and minerals. Studies have shown that children with ASD generally accept fewer types of foods than typically developing children, and unbalanced dietary patterns may be associated with constipation and other gastrointestinal symptoms [13-14].

The relationship between feeding problems and gastrointestinal symptoms is likely bidirectional. On one hand, restricted diets and insufficient intake of fiber and fluids may contribute to constipation, abdominal distension, and painful defecation. On the other hand, gastrointestinal discomfort, including abdominal pain, gastroesophageal reflux, nausea, or swallowing difficulties, may promote food avoidance and further narrow dietary choices. This interaction may increase nutritional risks and negatively affect daily functioning.

Children with ASD who experience both feeding difficulties and gastrointestinal symptoms may also exhibit more severe sensory problems, challenging behaviors, reduced adaptive functioning, and poorer quality of life [15-16]. However, current evidence is mainly derived from cross-sectional studies, and the causal relationships among feeding problems, gastrointestinal symptoms, and behavioral manifestations remain uncertain.

Clinical assessment should include dietary variety, eating patterns, fluid intake, mealtime behaviors, and chewing or swallowing abilities. Nutritional evaluation is recommended for children with highly restricted diets, abnormal growth, or suspected nutrient deficiencies. New-onset or worsening food refusal should not be attributed solely to ASD-related behaviors; potential medical causes, including constipation, gastroesophageal reflux disease, oral disorders, and swallowing problems, should also be considered.

### 5. Contributing Factors and Emerging Biological Mechanisms of Gastrointestinal Symptoms

The development of gastrointestinal (GI) symptoms in children with autism spectrum disorder (ASD) is likely influenced by multiple interacting factors, including dietary patterns, bowel behaviors, sensory characteristics, psychological factors, medication exposure, and gut microbiota alterations [11]. However, most available evidence is derived from observational studies, and the causal

relationships among these factors remain unclear.

### 5.1 Dietary, Behavioral, and Psychosocial Factors

Constipation in children with ASD may be associated with limited dietary fiber and fluid intake, reduced physical activity, irregular bowel habits, and difficulties with toilet training [11]. Stool withholding may occur due to difficulties recognizing bowel sensations, aversion to toileting environments, sensory sensitivities, or previous painful defecation experiences. Persistent stool retention may further contribute to hard stools, painful bowel movements, and recurrent constipation.

Food selectivity may affect gastrointestinal function by limiting dietary diversity and reducing fiber intake. However, food selectivity should not be considered the sole cause of GI symptoms, as abdominal pain, reflux, and discomfort associated with bowel movements may also promote food avoidance.

Sensory sensitivities and communication difficulties may influence how children perceive and express gastrointestinal discomfort. Children with limited verbal abilities may demonstrate nonspecific behaviors, such as food refusal, crying, sleep disruption, or behavioral changes. These behaviors may provide clues for clinical evaluation but cannot independently identify the source of discomfort.

Anxiety, psychological stress, and sleep disturbances may coexist with gastrointestinal symptoms. Environmental changes, disrupted routines, or increased sensory stimulation may contribute to symptom fluctuations, whereas persistent abdominal pain, reflux, or painful defecation may further affect sleep and emotional regulation. Current evidence remains insufficient to determine causal relationships among psychological factors, sleep problems, and gastrointestinal symptoms.

### 5.2 Medication-Related Factors

Children with ASD may receive psychotropic or neurological medications for irritability, attention-deficit/hyperactivity disorder, anxiety, sleep disturbances, or epilepsy. Some medications may be associated with gastrointestinal adverse effects, including constipation, nausea, diarrhea, appetite changes, and weight alterations [11]. Medication exposure may also indirectly influence gastrointestinal function through changes in activity levels and dietary intake.

Clinical assessment should include medication type, dosage, duration, and recent adjustments. When gastrointestinal symptoms develop or worsen after medication changes, potential drug-related effects should be considered. However, medication discontinuation or dose adjustment should be determined through individualized risk-benefit assessment rather than caregiver-directed changes.

### 5.3 Gut Microbiota and Biological Mechanisms

The microbiota-gut-brain axis represents a bidirectional communication network involving the gastrointestinal tract, gut microbiota, immune system, endocrine pathways, and

nervous system [17]. Studies have suggested that children with ASD may exhibit differences in gut microbiota composition compared with typically developing children; however, specific microbial alterations have not been consistently identified across studies [18].

Microbiome findings are strongly influenced by dietary patterns, constipation, age, geographic variation, antibiotic exposure, probiotic use, and analytical methods. Yap et al. [19] demonstrated that autism-associated dietary preferences may contribute substantially to observed microbiome differences, suggesting that some microbial alterations may reflect dietary selectivity or gastrointestinal symptoms rather than ASD-specific biomarkers.

Alterations in intestinal barrier function and immune responses have also been proposed as potential mechanisms. However, current evidence is insufficient to confirm widespread intestinal permeability changes or specific immune abnormalities in children with ASD. No validated microbiome, immune, or intestinal barrier biomarkers are currently available for routine clinical diagnosis or treatment monitoring.

## 6. Clinical Assessment and Diagnostic Considerations

The evaluation of gastrointestinal (GI) symptoms in children with autism spectrum disorder (ASD) should follow general pediatric gastrointestinal principles, including careful history taking, physical examination, recognition of alarm features, and targeted investigations when clinically indicated [7,21]. ASD itself does not account for all gastrointestinal manifestations and should not be considered an indication for routine invasive investigations. Clinical assessment should incorporate communication abilities, sensory characteristics, feeding behaviors, toileting patterns, and behavioral changes to avoid misinterpreting physical discomfort as ASD-related behavior.

### 6.1 History and Symptom Assessment

Clinical history should characterize symptom type, onset, duration, frequency, potential triggers, and impact on eating, sleep, and daily functioning. For constipation, assessment should include stool frequency, stool consistency, painful defecation, stool withholding, fecal incontinence, and possible fecal retention. Overflow fecal leakage caused by stool retention should be distinguished from true diarrhea.

Evaluation of abdominal pain should consider its relationship with meals, bowel movements, activity, and emotional changes, as well as associated symptoms such as vomiting, diarrhea, fever, nocturnal symptoms, or weight loss. For children with limited communication abilities, caregiver observations and behavioral indicators, including food refusal, sleep disturbance, abdominal pressing, or sudden behavioral changes, may assist assessment. However, these behaviors are nonspecific and cannot establish a gastrointestinal diagnosis alone.

Clinical evaluation should also include dietary patterns, fluid intake, food selectivity, chewing and swallowing abilities,

physical activity, toileting behaviors, medication use, and nutritional supplements. Symptom diaries documenting food intake, bowel habits, pain episodes, sleep, and behavior changes may provide additional information when symptom patterns are unclear.

## 6.2 Alarm Features and Additional Investigations

Children without alarm features, normal growth, and clinical features consistent with disorders of gut-brain interaction (DGBIs) can generally be managed based on clinical assessment without extensive diagnostic testing [22].

Further investigation should be considered when alarm features are present, including weight loss or growth failure, gastrointestinal bleeding, persistent or bilious vomiting, dysphagia, persistent fever, nocturnal diarrhea, severe localized abdominal pain, significant abdominal tenderness, abdominal masses, or abnormal perianal findings. Laboratory investigations should be selected according to suspected diagnoses and may include blood counts, inflammatory markers, electrolyte assessment, nutritional parameters, and targeted tests for conditions such as celiac disease, inflammatory bowel disease, infection, or thyroid disorders.

Imaging, endoscopy, and gastrointestinal motility studies should be guided by clinical indications, investigation results, and treatment response. These procedures should not be performed routinely solely because of an ASD diagnosis. Commercial microbiome tests, intestinal permeability assessments, and unvalidated food intolerance tests currently lack sufficient evidence for clinical use and should not guide routine diagnostic or therapeutic decisions.

## 6.3 Differential Diagnosis and Referral

Differential diagnosis should initially focus on common pediatric gastrointestinal disorders, including functional constipation, abdominal pain-related disorders of gut-brain interaction, gastroesophageal reflux disease, gastrointestinal infections, and medication-related adverse effects.

Children with reflux or vomiting require differentiation between physiological gastroesophageal reflux and gastroesophageal reflux disease, which involves troublesome symptoms or complications. Nonspecific behaviors such as crying, food refusal, or nighttime awakening should not be used alone to establish this diagnosis [23].

Persistent symptoms or the presence of alarm features should prompt consideration of other conditions, including celiac disease, inflammatory bowel disease, food allergy, carbohydrate malabsorption, eosinophilic gastrointestinal disorders, thyroid disorders, structural abnormalities, oral diseases, and swallowing disorders.

Referral to pediatric gastroenterology should be considered for children with alarm features, diagnostic uncertainty, impaired growth, highly restricted diets, or inadequate response to standard treatment. When feeding, nutritional, or swallowing problems coexist, multidisciplinary assessment involving nutrition specialists, developmental-behavioral specialists, and swallowing therapists may be appropriate.

## 7. Management Strategies

Management of gastrointestinal (GI) symptoms in children with autism spectrum disorder (ASD) should focus on identifying specific gastrointestinal disorders, addressing modifiable risk factors, and evaluating nutritional status, while following evidence-based principles used in general pediatric practice [21]. Treatment approaches should be individualized according to the child's communication abilities, sensory characteristics, feeding behaviors, and toileting patterns. Although improvement of gastrointestinal symptoms may reduce behaviors associated with pain or discomfort, current evidence does not demonstrate that treatment of gastrointestinal symptoms improves the core symptoms of ASD.

### 7.1 Standard Symptom-Based Treatment

Management of functional constipation includes caregiver education, regular toileting routines, and optimization of fluid intake, dietary fiber intake, and physical activity [24-25]. When fecal impaction is present, disimpaction should be performed before maintenance therapy. Osmotic laxatives such as polyethylene glycol may be used when pharmacological treatment is required, with dosage and duration adjusted according to clinical response and adverse effects. Continued maintenance therapy is often necessary after symptom improvement to prevent recurrence.

For children with stool withholding, difficulty expressing bowel sensations, or toileting avoidance, behavioral strategies such as scheduled toilet sitting, visual supports, gradual adaptation, and positive reinforcement may be helpful. However, behavioral interventions should complement rather than replace appropriate medical treatment.

Management of diarrhea should consider infectious, dietary, and medication-related causes, with attention to dehydration and electrolyte disturbances. Recurrent abdominal pain requires evaluation of constipation, gastroesophageal reflux disease, and disorders of gut-brain interaction. In children with reflux or vomiting, gastroesophageal reflux disease should be distinguished from physiological reflux, and empirical acid-suppressive therapy should not be initiated solely based on nonspecific symptoms such as food refusal, crying, or sleep disturbance [23].

### 7.2 Nutritional and Behavioral Interventions

Nutritional management should be guided by dietary assessment, growth monitoring, and evaluation of nutritional risks. For children with limited fiber or fluid intake, gradual dietary modification should be introduced within the range of acceptable foods. Children with highly restricted diets, abnormal growth, or suspected nutrient deficiencies may benefit from assessment by nutrition professionals.

Nutritional supplements should be selected according to individual dietary needs rather than routinely prescribed without clear indications. Feeding interventions may include structured routines, visual schedules, gradual exposure to new foods, task-based approaches, and positive reinforcement. Before implementing behavioral feeding strategies, clinicians

should evaluate potential medical contributors, including constipation, reflux, oral problems, and swallowing difficulties.

### 7.3 Evidence and Limitations of Non-standard Interventions

Evidence regarding probiotics and prebiotics for gastrointestinal symptoms in children with ASD remains limited and heterogeneous. Although some studies have reported potential improvements in gastrointestinal symptoms, differences in probiotic strains, dosages, intervention duration, study populations, and outcome measures limit clinical interpretation. The effects of these interventions on ASD core symptoms remain uncertain [26-31].

Current evidence does not support routine use of gluten-free or casein-free diets for children with ASD without clearly identified food-related conditions [32-33]. Restrictive diets may increase nutritional risks and should be implemented only with appropriate clinical evaluation and nutritional monitoring.

Microbiota-based interventions, including microbiota transfer therapy and fecal microbiota transplantation, remain investigational and are not recommended for routine clinical practice. Preliminary studies have reported possible benefits; however, limited sample sizes, heterogeneous protocols, and insufficient long-term safety data prevent routine clinical recommendation [34-37].

### 7.4 Follow-up and Multidisciplinary Management

Follow-up should evaluate changes in gastrointestinal symptoms, dietary intake, bowel habits, growth, nutritional status, medication-related adverse effects, sleep, and daily functioning. Treatment outcomes should be assessed according to predefined clinical goals, such as improved bowel movements, reduced abdominal pain, expanded dietary variety, or stable growth.

Children with recurrent symptoms, uncertain diagnoses, treatment difficulties, or significant nutritional risks may require multidisciplinary management involving pediatric gastroenterologists, nutrition specialists, developmental - behavioral professionals, swallowing therapists, or behavioral intervention providers. However, multidisciplinary approaches should be individualized according to clinical needs rather than routinely applied to all children with ASD.

## 8. Limitations of Current Evidence and Future Directions

Current research on gastrointestinal (GI) symptoms in children with autism spectrum disorder (ASD) is characterized by substantial heterogeneity in symptom definitions, assessment methods, study populations, and data sources [3-4,6,12]. Many studies rely on caregiver-reported information, which may be influenced by recall bias and may not fully capture symptoms in children with limited communication abilities. Differences in age, cognitive and language abilities, dietary patterns, constipation status, medication exposure, and comorbid conditions further limit

comparisons across studies.

Most available studies are cross-sectional or case-control studies, making it difficult to determine causal relationships among gastrointestinal symptoms, food selectivity, behavioral manifestations, and gut microbiota alterations. Microbiome studies are particularly affected by confounding factors, including diet, constipation, antibiotic exposure, probiotic use, geographic variation, and analytical methods [18-19].

Evidence regarding probiotics and prebiotics remains limited by small sample sizes and heterogeneous interventions [27-31]. Findings on restrictive diets remain inconsistent [32-33], while studies of microbiota transplantation are limited by small samples, heterogeneous protocols, and short follow-up periods [34-37]. Therefore, current evidence should be considered preliminary and is insufficient to support routine application of non-standard interventions.

Future research should focus on establishing standardized definitions and assessment tools for gastrointestinal symptoms in ASD, conducting large-scale prospective multicenter studies, and improving clinical phenotyping based on gastrointestinal symptoms, feeding difficulties, and nutritional risks. Intervention studies should evaluate not only symptom improvement but also nutritional status, growth, sleep, quality of life, adverse effects, and long-term outcomes. The effectiveness and feasibility of individualized multidisciplinary management also require further investigation.

## 9. Conclusion

Gastrointestinal symptoms are common comorbid conditions in children with ASD and may adversely affect dietary intake, nutritional status, growth, sleep, and daily functioning. Because some children have limited communication abilities, gastrointestinal discomfort may present as food refusal, sleep disturbance, toileting avoidance, or behavioral changes. However, these manifestations are nonspecific and should not be used as independent diagnostic indicators.

Clinical management should follow evidence-based principles for pediatric gastrointestinal disorders, including appropriate history taking, physical examination, identification of alarm features, and targeted treatment of specific gastrointestinal conditions. Management should be individualized according to communication abilities, sensory characteristics, feeding behaviors, and bowel patterns.

Current evidence supporting probiotics, prebiotics, restrictive diets, and fecal microbiota transplantation remains insufficient, and these approaches should not replace standard clinical assessment and treatment. Future high-quality prospective studies with standardized evaluation methods and clinical stratification are needed to improve individualized management strategies for gastrointestinal symptoms in children with ASD.

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