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Dietary Patterns, Behavioral Regulation, and Cognitive Functioning in Autistic Children: A Contextual Analysis in St. Kitts and Nevis

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ABSTRACT

Across the Caribbean and particularly in St. Kitts and Nevis scientific attention to the relationship between diet, behavior, and cognitive functioning in autistic children remains significantly limited. Although educators frequently report challenges involving emotional dysregulation, inattention, and sensory based behaviors, these concerns are often addressed without examining the dietary patterns that may contribute to neurological and behavioral outcomes. This lack of contextualized evidence constrains the development of holistic intervention models suited to small island developing states. This study aims to analyze how dietary patterns influence behavioral regulation and cognitive functioning in autistic children in St. Kitts and Nevis, addressing the critical gap in region specific research that integrates nutrition with neurodevelopmental and educational outcomes. Specifically, the study investigates local eating habits, high-sugar food environments, parental beliefs regarding "detox" diets, and the observable behavioral and cognitive manifestations within home and school settings. Using a qualitative descriptive design, data will be collected from parents, teachers, and special education practitioners to map perceived links between diet, behavior, attention, memory, and executive functioning. Expected contributions include: (1) clarifying the dietary factors most associated with behavioral dysregulation in autistic learners, (2) identifying nutritional influences on attention, processing, and cognitive flexibility, (3) presenting culturally grounded dietary challenges unique to St. Kitts and Nevis, and (4) offering evidence-based recommendations for interdisciplinary collaboration among educators, caregivers, and health professionals to support holistic development.

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INTRODUCTION

Autism Spectrum Disorder (ASD) is increasingly recognized as a multidimensional neurodevelopmental condition in which behavioral regulation, sensory processing, and cognitive functioning are shaped not only by genetics and neurobiological underpinnings but also by an array of environmental and physiological factors. In the past decade, worldwide scientific attention has turned to the interaction between patterns of diet, the gut-brain axis, and behaviors among children with autism. This shift in focus is based on the growing evidence that the composition and function of the gut microbiota may influence neural development, emotional regulation, and cognitive processing. Modern reviews on the microbiota gut-brain axis present arguments that the gastrointestinal system is not just a digestive organ but a key neurobiological ecosystem with great consequences for mental health and neurodevelopment. The reviews by Morais et al., 2021; Cryan et al., 2019; Sarkar et al., 2018, provide evidence to support this.

Running parallel to this biological understanding, nutrition and diet have emerged as paramount behavioral and therapeutic considerations. Restricted patterns of food selectivity, narrow food repertoire, and nutrient imbalances are astoundingly common among autistic children, which begs the question of how such patterns interface with cognition, social-emotional functioning, and behavior. Large-scale cohort studies suggest that dietary preferences in autistic populations may have a close affinity with alterations in gut microbial diversity as Yap et al., 2018; Wang et al., 2025 discussed in their work. More precisely, Kang et al., 2019; 2020has suggested that restricted diets might worsen the microbial imbalance, thereby influencing irritability, attention, and executive functioning. Promising behavioral improvements to have been indicated with interventionist work such as microbiota transfer therapy; however, this continues to be constrained by small samples and limited methodological rigor (Kang et al., 2019; 2020).

Similar variability exists within the literature on therapeutic diets, such as gluten-free and casein-free (GFCF) approaches. Although certain analyses do indicate improvements in stereotypies and cognitive performance, most systematic reviews have methodological weaknesses, inconsistent findings, and a lack of large, blinded, randomized controlled trials. (Li et al., 2018; Piwowarczyk et al., 2020; Quan et al., 2024). Probiotic and prebiotic interventions also show promise, with both behavioral and gastrointestinal benefits; however, these studies are highly varied in terms of strain type, dosage, and duration, as well as outcome measures. As Navarro et al. reported in 2024, and Liu et al. reported in 2022, such findings collectively point toward a rapidly evolving yet still unstable evidence base.

Within this scientific landscape, the Caribbean, and more specifically the Leeward Islands like St. Kitts and Nevis, remains critically underrepresented. Although international literature documents associations between diet, gut health, behavior, and cognition in ASD, these findings cannot be assumed to generalize to small island developing states. Caribbean children experience unique socio-cultural dietary practices, such as high carbohydrate reliance, limited access to specialist nutrition services, and increasing exposure to imported processed foods. Moreover, diagnostic resources are scarce, multidisciplinary intervention teams are limited, and studies are at a minimum regarding autism prevalence and developmental profiles within small island nations. Despite the holistic approach to education and wellbeing of children in the region, no published studies have examined how dietary patterns interact with behavioral regulation and cognitive functioning among autistic children in St. Kitts and Nevis.

Another resounding gap in the literature is the general lack of studies that combine dietary patterns with behavioral and cognitive outcomes within a socio-cultural context such as St. Kitts and Nevis. Most works usually isolate biological variables, such as microbiota composition, or assess symptoms at a clinical level without taking into consideration how cultural norms about diet, family food practices, and local health systems affect children lived experiences. Beyond that, almost all high-impact studies are from North America, Europe, or East Asia; the gap for Caribbean-specific evidence is profound.

Research Gap

Although there is extensive international work linking dietary patterns, gut health, behavioral regulation, and cognition in ASD, no existing research examines these relationships in Caribbean contexts, particularly in St. Kitts and Nevis. The unique dietary environment, structure of health care, and cultural practices of the region have never been integrated into a contextual analysis of ASD. This gap limits educators, clinicians, and policymakers in the development of culturally grounded evidence-based interventions that address both nutritional and behavioral needs. This study, then, addresses an important gap in existing literature by investigating associations between dietary patterns and behavioral regulation/cognitive functioning among autistic children in St. Kitts and Nevis. Through locating the research inquiry within a small developing island state, this study adds a new, more contextually rich layer to the current international discussion pertaining to ASD, nutrition, and child development.

Research Objectives

- To investigate dietary patterns in autistic children of St. Kitts and Nevis, focusing on food selectivity, nutrient intake, and eating habits influenced by culture, with the purpose of developing a contextual profile of nutritional practices in the local population.

- To investigate, using a dietary pattern approach, the relationship between diets and behavioral regulation, including irritability, emotional responsiveness, sensory reactivity, and self-regulation in autistic children in St. Kitts and Nevis.
- To examine how the dietary practices may relate to cognitive functioning, including attention, executive skills, and processing speed, and learning behaviors among children with autism within both educational and home settings in St. Kitts and Nevis.
- Investigating parents', teachers', and health professionals' perceptions of how diet relates to behavioral and cognitive development in children with autism by taking into consideration cultural beliefs, resource constraints, and accessibility of nutritional support services.
- Define context-specific nutritional barriers and facilitators (i.e., food availability, economic issues, cultural norms, access to dietary interventions) to support evidence-based recommendations that are culturally contextualized and geared toward the holistic development of autistic children in St. Kitts and Nevis.

2. CONCEPTUAL AND THEORETICAL FRAMEWORK

2.1 Definitions and Key Concepts

Defining Autism Spectrum Disorder (ASD)

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by persistent differences in communication, social reciprocity, behavioral flexibility, and sensory processing reactivity (Cryan et al., 2019). Contemporary literature increasingly conceptualizes ASD as involving systemic neurobiological pathways rather than solely behavioral manifestations. Notably, emerging evidence identifies ASD as intertwined with the brain gut microbiome axis, which regulates neural signaling, inflammation, and behavior (Saurman et al., 2020). These models reinforce that ASD symptom presentation varies widely, shaped by genetic, gastrointestinal, environmental, and sociocultural factors, including those unique to Caribbean small island contexts.

Defining Dietary Patterns in ASD

Different eating patterns among autistic children include food selectivity, rigid preferences, sensory-dependent aversions, and significantly restricted food repertoires. Lewandowska-Pietruszka et al., 2023 and Nogueira-de-Almeida et al., 2025 contributed to the global reviews about autistic children. These reviews revealed that sensory sensitivities drive many autistic children toward carbohydrate-heavy, processed, or soft-textured foods, often with vitamin, mineral, and amino acid deficiencies as a result. These concerns become magnified in St. Kitts and Nevis, where the national diet often reflects strong dependence on wheat-based imports, sugary beverages, fried street foods, and inexpensive convenience products due to cost and accessibility. Dietary patterns-not merely gut composition-have been consistently shown to be important predictors of microbial diversity in ASD (Di Benedetto et al., 2025) and shape behavioral and cognitive outcomes more strongly than earlier assumed.

Behavioral Regulation Constructs

Behavioral regulation in autistic children includes irritability, sensory reactivity, emotional responsiveness, hyperactivity, and the ability to self-regulate across environments. Gut–brain research provides consistent findings regarding dietary intake and microbiota profiles associated with aggression, anxiety, and attention difficulties among children (Chakrabarti et al., 2022; Tan et al., 2021). Caribbean practitioners often report that autistic students struggle with transitions, overstimulation, and food-triggered irritability patterns, which are supported by evidence showing that metabolic and digestive discomfort may enhance emotional dysregulation.

Cognitive Functioning Domains

Cognitive functioning comprises attention regulation, processing speed, executive functioning, working memory, and learning behaviors. The microbiota gut brain literature increasingly links nutrient status with neural development and cognitive performance (Fang et al., 2025; Li et al., 2024). Nutrient insufficiencies, especially omega-3s, B vitamins, amino acids, and zinc may compromise synaptic functioning, sustaining difficulties with attention, task persistence, and processing accuracy (Li et al., 2024). Such deficits may be pronounced in societies like St. Kitts and Nevis, where healthier foods are expensive and children from low-income homes may rely heavily on nutrient-poor imported goods.

Caribbean Contextual Markers

St. Kitts and Nevis has a particular sociocultural dietary ecosystem defined by:

- High-carbohydrate staples: dumplings, breadfruit, rice, Johnny cakes.
- imported processed foods dominate the supermarket shelves.
- Seasonal availability of local produce.
- Economic constraints limiting consistent access to healthier foods.
- Small island healthcare and educational systems with limited ASD-specific dietetic support.

These contextual elements directly shape autistic children's diets, nutrition related vulnerabilities, and school-based behaviors, underscoring the significance of a localized theoretical understanding of ASD.

2.2 Relevant Psychological and Biological Theories

Gut Brain Axis Framework

The gut-brain axis explains the interrelationship between microbial communities, immune responses, metabolic outputs, and neural pathways that influence behavior, emotion, and cognition. Cryan et al., 2019 have demonstrated mechanistic pathways whereby gut dysbiosis modifies neurotransmitter production, stress responses, and neuroinflammation in the context of ASD, Yap et al. 2024 also demonstrated that dietary preference, rather than ASD severity alone, mediates gut microbiome patterns. Diets characteristic of the Caribbean, with high levels of refined carbohydrate and low levels of fiber, can perturb microbial diversity and may be an exacerbating influence on irritability, sleep problems, and cognitive sluggishness. (Chakrabarti et al., 2022; Kang et al., 2019).

Sensory Processing Theory (Dunn, 1997)

Although Dunn's basic theory predates our 2018–2025 window, it remains key to understanding feeding difficulties associated with ASD. Recent gut–brain studies confirm that sensory over-responsivity is interacting with gastrointestinal distress to reinforce restrictive diets (Lewandowska-Pietruszka et al., 2023). This theoretical relationship is echoed clinically as Caribbean caregivers commonly relate how children refuse local produce, like callaloo or pumpkin, because of "texture issues."

Ecological Systems Theory (Bronfenbrenner)

Bronfenbrenner situates ASD dietary and behavioral functioning within interconnected systems:

- Microsystems: caregiver feeding behaviors, home food availability
- Mesosystems: Collaboration between teachers, clinicians, and families working together
- Ecosystems: food pricing, government policies, school feeding programs.
- Macrosystems: cultural norms such as heavy use of starch or "sweet drinks."

Reviews of research point to the ecological aspect of ASD problems, especially from families depending on imported food and where ASD support networks are few (Pérez-Cabral et al. 2024; Elshamy et al. 2025).

Neurocognitive Developmental Models

These models propose that nutrition affects neural pathways related to attention, learning, and executive functioning. Studies show that certain nutritional interventions, such as probiotics, omega-3 supplementation, and microbiota transfer therapy, generate quantifiable behavioral and cognitive effects (Tan et al., 2021; Kang et al., 2020; Yu et al., 2022). The application of these models highlights an important yet scantily investigated area in Caribbean settings, where nutrient deficiencies may have both cultural and economic bases.

Biopsychosocial Framework

The biopsychosocial model integrates social factors, such as family eating habits and school accommodation; psychological experiences, including emotion regulation and sensory stress; and biological determinants of gut microbiota and nutrient metabolism. This integrated perspective is regularly adopted in recent ASD literature (Fang et al., 2025; Rahim et al., 2023). This framework fits nicely within Caribbean realities, where converging family traditions, economic limitations, and a general lack of ASD services so often shape children's daily functioning.

2.3 Caribbean-Specific Sociocultural Context

Cultural Dietary Practices in St. Kitts and Nevis

The Kittitian Nevisian diet combines African ancestry, British colonial influences, and international fast-food trends of today. Foods commonly consumed by children include bread, pasta, fried chicken, biscuits, sweetened drinks, and high-sodium snacks-all foods that have been implicated in gut dysbiosis and behavioral dysregulation in ASD (Yap et al., 2024; Di Benedetto et al., 2025). Locally available produce such as mangoes, papaya, dasheen, and spinach may be expensive, intermittently available, or rejected due to sensory sensitivity.

Healthcare and Educational Landscape

The island's health care system includes dedicated pediatricians; however, there are few gastrointestinal specialists, no full-time ASD dietitians, and disjointed ASD services. Unlike internationally studied interventions, schools often lack systematic behavioral dietary tracking or personalized nutrition (Yu et al., 2022; Takyi et al., 2025). Teachers often note that during late morning each day, children who have sugary snacks in the morning experience attention crashes. This is very consistent with global findings which suggest a relationship between diet and executive functioning.

Family Dynamics and Food Practices

Intergenerational cooking habits in St. Kitts and Nevis, which include rice-heavy lunches, fried bakes,

dumplings, and saltfish breakfasts, may inadvertently reinforce low dietary diversity. Moreover, ASD feeding rigidity might be misunderstood by the caregivers as "picky behavior" rather than gastrointestinal distress or an issue with sensory processing. Such trends are in tune with the findings presented by Lewandowska-Pietruszka et al. (2023) that the dietary outcomes in ASD are much influenced by parental understanding.

Gaps in Regional ASD Support Systems

Despite gut brain research developments around the world, the Caribbean remains underrepresented within literature. No diet-behavior empirical studies relating to ASD have been conducted in St. Kitts and Nevis. Although evidence exists that diet and microbiota directly impact emotional and cognitive functioning, few nutrition-based ASD programs are implemented within regional school systems, with limited incorporation of dietary information into behavioral assessments (Cryan et al. 2019; Kang et al. 2020; Pérez-Cabral et al. 2024).

3. PURPOSE AND OBJECTIVE OF THE STUDY

3.1 Purpose Statement

This paper reviews recent international research on the links between dietary habits, behavioral control, and cognitive functioning in children with autism and subsequently applies these findings to the unique sociocultural context of St. Kitts and Nevis. Despite international literature showing rapid growth in gut-brain research, particularly in relation to ASD, small-island developing states within the Caribbean have been largely absent from such discussions (Cryan et al., 2019; Lewandowska-Pietruszka et al., 2023; Fang et al., 2025). This absence is striking against the background of shifting nutritional profile conditions in the region, which, due to imported processed foods, staple foods with heavy carbohydrate content, and volatile food prices, makes it hard for families raising neurodivergent children to establish stable and nutritious diets.

Everyday life in St. Kitts and Nevis reflects both structural constraints and Caribbean resiliencies. Parents continue to bargain between "what the family can reasonably afford," "what the child will eat," and "what the supermarket has this week." These facts influence eating habits that may, in turn, shape how autistic children act and think (Di Benedetto et al. 2025). Yet, despite global findings that show how dietary selectivity, gut microbiome composition, and nutrient intake are shaping emotional regulation and cognition, no comparative analyses are available for Caribbean populations (Elshamy et al. 2025; Pérez-Cabral et al. 2024).

It is for this reason that this review has a threefold objective. First, it synthesizes global and mechanistic evidence from the biological, psychological, and nutritional sciences on the gut-brain axis, microbiome interventions, exclusion diets, probiotics, and nutrient-based therapies based on high-impact studies, such as, Kang et al., 2019, Tan et al., 2021, Li et al., 2024, and González-Domenech et al., 2022. Second, it develops a richer understanding of how regional sociocultural contexts shape dietary practices in ways not well captured by international models through its juxtaposition of global knowledge against the lived realities of families, schools, and healthcare systems in St. Kitts and Nevis. Third, the review proposes a systematic/scoping framework that is inclusive of Caribbean epistemologies; small-island countries, which report scarcity of research, need interpretations of theories through Caribbean-specific conditions-economic precariousness, dependence on imported foods, lack of specialized care, deeply embedded family foodways rather than imports of theory from the Global North.

In so doing, the review hopes to shed light on the policy, educational, and clinical implications for developing small island nations like St. Kitts and Nevis. Furthermore, this review supports a growing body of thought that promotes contextually grounded autism research instead of the marginalization of Caribbean populations within the international scientific discourse As such, this work is both a scholarly effort and an act of regional advocacy on behalf of educators, clinicians, health and education ministries, and families in search of culturally relevant and empirically supported strategies to improve the developmental trajectories of children with autism.

3.2 Research Objectives

The study suggests the following research goals in light of the global literature and the regional gaps mentioned in the introduction:

1. To understand dietary patterns in children with autism in St Kitts Nevis.
2. To explore the influence of eating behaviors on behavioral regulation of autistic children in St. Kitts and Nevis.
3. To investigate the relation of eating habits on cognitive performance of autistic children in St. Kitts and Nevis.
4. To explore how parents, educators, and medical professionals perceive the role of diet in autistic children's behavioral and cognitive development in St. Kitts and Nevis.

3.3 To identify context-specific nutritional challenges and facilitators to provide evidence-based, culturally appropriate recommendations for St. Kitts and Nevis.

3.4 Research Questions

The following review questions direct the investigation in accordance with the declared purpose and objectives.

1. What are the dietary habits known to exist among children with autism in St. Kitts and Nevis?
2. What is the relation between these eating habits and the results of behavioral regulation in autistic children in St. Kitts and Nevis?
3. What is the relation between the diet of children with autism and their cognitive functioning in St. Kitts and Nevis?
4. Which sociocultural factors affect behavior, diet, and thought processes on autistic children in St. Kitts and Nevis?
5. What are the recommendations to nutritional intervention implementation in St. Kitts and Nevis?

4. METHODOLOGY

This review uses systematic scoping hybrid design, a methodological strategy that is gaining increasing popularity in developing interdisciplinary fields, such as behavioral cognitive development, gut-brain research, and autism nutrition. A stand-alone traditional systematic review would be inappropriately restrictive, given the evolving and sometimes contentious nature of the evidence linking dietary patterns to behavioral and cognitive functioning in children with autism. A scoping review alone would not provide the level of analytical rigor required for policy, clinical, and educational implications in St. Kitts and Nevis. This review has been purposefully positioned as a PRISMA-aligned systematic/scoping review in order to increase transparency and provide the breadth needed to integrate findings across nutrition science, developmental psychology, neurobiology, education, and Caribbean sociocultural studies.

4.1 Review Design

This review adheres to the PRISMA 2020 standards for structuring identification, screening, and synthesis (Page et al., 2021), extending the scope to include evidence from randomized controlled trials, microbiota transfer studies, large-scale observational cohorts, and narrative reviews (e.g., Cryan et al., 2019; Lewandowska-Pietruszka et al., 2023). The integrative nature is necessary because dietary-related research tied to autism is seldom isolated to nutrition alone; instead, it consistently intersects with gut-brain pathways (Chakrabarti et al., 2022; Fang et al., 2025), microbiota diversity (Yap et al., 2024), behavioral outcomes (Tan et al., 2021), and neurocognitive mechanisms (Saurman et al., 2020).

An interdisciplinary approach becomes even more important in small island settings where the family's food traditions, health services, and educational support are so intimately interrelated. In contrast to diets in urban areas, Caribbean families often depend on traditional ways of eating foods such as bush teas, starchy ground provisions, fresh fruits, salted foods, and locally produced juices, which may have different implications for nutrient intake and gut-brain dynamics. The design of this review is intended to consider evidence from international studies while sustaining a culturally grounded perspective relevant to St. Kitts and Nevis considering these contextual realities.

4.2 Eligibility Criteria (Inclusion & Exclusion)

Eligibility criteria were guided by the PEO framework (Population, Exposure, Outcomes).

Population

Studies were eligible if they focused on **autistic children aged 2–18**. This range was selected because the majority of dietary, behavioral, and cognitive intervention studies cluster in early and middle childhood (Piwowarczyk et al., 2018; Quan et al., 2022).

Exposure / Phenomena of Interest

Eligible studies examined one or more of the following:

• Dietary patterns, nutrient intake, food selectivity
• Gluten free/casein free diets (Piwowarczyk et al., 2018; González-Domenech et al., 2022)
• Microbiota gut brain interactions (Cryan et al., 2019; Fang et al., 2025)
• Microbiota transfer or probiotic interventions (Kang et al., 2019; Feng et al., 2023)

Outcomes

Included outcomes were:

• Behavioral regulation, irritability, emotional reactivity (Tan et al., 2021)
• Cognitive functioning, attention, processing speed, executive skills (Lewandowska-Pietruszka et al., 2023)
• Sensory behavior and neurobiological indicators (Chakrabarti et al., 2022)

Study Types

Due to the interdisciplinary nature of the topic, the review accepted:

• RCTs, cohort studies, case control studies
• Mixed methods and qualitative studies
• Systematic reviews and meta-analyses (Yu et al., 2022; Rahim et al., 2023)
• Narrative reviews when evidence was emerging (Li et al., 2024)

Geographic Scope

Global studies were included, with **special analytic attention to any Caribbean-region data** though Caribbean literature remains scarce, reflecting the very gap this review seeks to address.

Years of Publication: 2018–2025

This time frame encompasses the growth in gut microbiota research and dietary interventions for ASD, especially seminal works like Cryan et al. (2019) and Yap et al. (2024).

Language

Only **English-language** publications were included. This is justified pragmatically: St. Kitts and Nevis is an English-speaking nation, and English research ensures accessibility for regional policymakers, teachers, and clinicians.

Exclusion Criteria

- Studies on neurotypical populations
- Adult ASD samples
- Only studies conducted in biomedical labs without behavioral or cognitive outcomes
- Studies on interventions that were exclusively pharmacological

4.3 Information Sources and Search Strategy

Searches were conducted in:

Scopus, Web of Science, PubMed, PsycINFO, ERIC, CINAHL.

These databases offer thorough coverage of literature in the fields of education, psychology, biomedicine, and public health

Grey Literature

- WHO and PAHO reports on child health and nutrition
- UNICEF Caribbean publications
- CARPHA situational analyses
- Ministry of Health (St. Kitts and Nevis) reports on childhood development, food security, and autism services

Search Strings

Example core search string:

("autism" OR "ASD") AND ("diet" OR "nutrition" OR "food selectivity" OR "gut microbiome") AND ("behavior" OR "irritability" OR "emotion regulation") AND ("cognition" OR "executive function") AND ("Caribbean" OR "small island developing states" OR "SIDS").
Boolean operators, truncation, and phrase searching were used to ensure comprehensive retrieval. Reference chaining was performed using seminal papers such as Cryan et al. (2019), Kang et al. (2019, 2020), and Yap et al. (2024).

4.4 Screening Process

The PRISMA screening process included:

Identification: Search results were exported to **Covidence** for automated duplicate removal.

Screening: Two reviewers, blinded to author and journal details, independently screened titles and abstracts based on inclusion criteria.

Eligibility

The relevance of full text articles to behavioral regulation, dietary patterns, and cognitive outcomes was examined.

Inclusion

Articles meeting the criteria were included in the final synthesis.
Discrepancies were resolved through discussion or third-reviewer adjudication. PRISMA 2020 templates were used to document the number of records at each stage.

4.5 Data Extraction

A standardized coding framework was used. Extracted variables included:

- Study design and sample characteristics
- Geographic context
- Dietary variables assessed
- Behavioral outcomes (e.g., irritability, sensory reactivity)
- Cognitive outcomes (e.g., attention, executive function)
- Mechanistic frameworks such as gut–brain axis pathways (Cryan et al., 2019; Chakrabarti et al., 2022)
- Key findings and limitations

Inter-rater reliability was calculated using Cohen's κ for categorical variables and intraclass correlations for continuous variables.

4.6 Quality Appraisal / Risk of Bias

Because the literature includes diverse designs, multiple tools were used:

- **CASP** for qualitative studies
- **JBI checklists** for observational research
- **Cochrane RoB2** for RCTs
- **MMAT** for mixed methods studies

The use of multiple appraisal tools is justified, as interventions such as microbiota transfer therapy (Kang et al., 2019, 2020) differ methodologically from dietary elimination trials (Piwowarczyk et al., 2018) and from mechanistic reviews of the gut brain axis (Fang et al., 2025).

Risk of bias assessments were independently performed by two reviewers, with discrepancies reconciled via consensus.

4.7 Data Synthesis Approach

A hybrid qualitative narrative synthesis was used because of the variation among the studies.

Qualitative Thematic Synthesis

The following findings were integrated using thematic analysis:

- control of behavior (Tan et al., 2021; Rahim et al., 2023)
- cognitive performance (Lewandowska-Pietruszka et al., 2023)
- gut-brain connections that contribute to behavior (Cryan et al., 2019; Fang et al., 2025)

Narrative Quantitative Synthesis

Due to study heterogeneity, effect sizes, prevalence estimates, and nutrient-behavior associations were, when appropriate, integrated narratively rather than meta-analytically.

Contextual Mapping for St. Kitts and Nevis

Because Caribbean data is sparse, a contextualization procedure was added:

- mapping results to the availability of local foods, including imported processed foods and diets high in starch
- The role of culture in children's eating behavior
- Considering the limitations of health care in small islands

This mapping makes it possible to interpret global evidence for St. Kitts and Nevis in a meaningful way, guaranteeing that the review actively translates the literature into Caribbean realities rather than just summarizing it.

5. RESULTS

5.1 Study Selection

A total of 1,372 records were identified from a comprehensive search of six electronic databases: Scopus, Web of Science, PubMed, PsycINFO, ERIC, and CINAHL, along with targeted grey literature from WHO, UNICEF Caribbean, and CARPHA reports. After removing 289 duplicates, 1,083 unique records remained for title and abstract screening. Of these, 782 were excluded for not meeting the inclusion criteria, largely because they addressed adult samples, non-ASD populations, or unrelated biological topics. Forty-three of the 301 studies that underwent full text assessment were included in the review. These studies specifically focused on dietary habits, behavioral control, and cognitive functioning in children with autism. These included a scant number of socio-cultural contexts outside Western populations: six studies in all, reflecting a significant gap in research targeting Caribbean contexts, such as Cryan et al. (2019) and Yap et al. (2024). The PRISMA flow process highlighted a strong concentration of studies emanating from North America (n = 18), Europe (n = 12), and East Asia (n = 7). This trend indicates a need to contextualize global findings within small island developing states like St. Kitts and Nevis, which may exhibit very different family norms, healthcare access, and food consumption.

5.2 Characteristics of Included Studies

The included studies adopted a range of methodological approaches. RCTs of gluten- and casein-free diets and probiotic/prebiotic interventions comprised 12 studies (Piwowarczyk et al., 2018; Quan et al., 2022; Tan et al., 2021), while cohort studies on dietary intake, food selectivity, and gut microbiota diversity comprised 15 studies (Yap et al., 2024; Di Benedetto et al., 2025). Qualitative and mixed-methods studies on parental perceptions, cultural food practices, and behavioral outcomes totaled eight studies (Elshamy et al., 2025; Mendive Dubourdieu & Guerendiain, 2023). The remaining eight were systematic and narrative reviews synthesizing interventional and observational data (Chakrabarti et al., 2022; Pérez-Cabral et al., 2024; Nogueira-de-Almeida et al., 2025 Participants spanned ages 2 to 18 years and reflected developmental stages that have been identified as critical in both early intervention and school-based nutritional strategies. Dietary patterns were operationalized to include food selectivity, restricted eating behaviors, nutrient intake, and culturally influenced diets across these studies. Behavioral regulation outcomes included irritability, emotional responsiveness, sensory reactivity, and self-regulation, while cognitive functioning encompassed attention, executive skills, processing speed, and learning behaviors. Overall, although the studies provided a sound evidence base for examining diet-behavior-cognition relationships, the absence of Caribbean-specific research remains striking.

5.3 Global Findings on Diet and Behavioral Regulation

International evidence has established that dietary patterns are significantly linked to behavioral regulation in autistic children. Restricted diets, selective eating, and nutrient insufficiencies have been associated with increased irritability, emotional dysregulation, and sensory reactivity (Cryan et al., 2019; Kang et al., 2019; Yap et al., 2024). Cohort analyses suggest that children with a limited diet often display higher tantrums, emotional lability, and difficulties in self-regulation (Di Benedetto et al., 2025). Interventions targeting the gut microbiome, including microbiota transfer therapy and probiotic supplementation, have established improvements in irritability and behavioral adaptability, presumably mediated via gut-brain axis mechanisms (Kang et al., 2020; Tan et al., 2021). Besides, hypersensitivity to textures, tastes, and smells in sensory processing accounts for more dietary selectivity and behavioral dysregulation (Cryan et al., 2019; Lewandowska-Pietruszka et al., 2023). Children with marked oral sensory sensitives tend to refuse nutrient-dense foods, leading to difficulties in self-regulation of mood, attention, and social interaction. Altogether, these findings confirm the idea of integrated assessments covering nutrition, behavior, and sensory profiles.

5.4 Global Findings on Diet and Cognitive Functioning

Dietary habits also affect cognitive functioning in autistic populations. Longitudinal and interventional studies provide evidence for a positive correlation between improved nutrient balance, sufficient intake of micronutrients, and enhanced attention, executive function, and processing speed (Li et al., 2024; Di Benedetto et al., 2025). Microbiota-mediated interventions, including probiotics, prebiotics, and fecal microbiota transplantation, have demonstrated gains in working memory, problem-solving, and learning behaviors, with such outcomes deemed limited by small sample sizes and heterogeneous study designs (Kang et al., 2019; Li et al., 2024; Pérez-Cabral et al., 2024). These data mechanistically link nutrition with gut microbiota composition and neural development and point to the possibility that dietary manipulations might affect cognitive performance and even brain plasticity (Cryan et al., 2019; Saurman et al., 2020). Importantly, dietary impacts seem moderated by age, baseline cognitive functioning, and ASD severity, putting a focus on individualized and context-sensitive approaches.

5.5 Contextual and Sociocultural Insights Relevant to the Caribbean

Despite the strong international evidence base, small island developing states like St. Kitts and Nevis remain critically underrepresented. The eating habits of the Caribbean, which include heavy reliance on starchy staples like rice, breadfruit, and yams, combined with frequent consumption of imported processed foods, may well affect the prevalence and expression of selective eating behaviors in autistic children. Economic limitations, a lack of multidisciplinary teams, and limited ASD-focused services clearly constrain access to specialized diets or nutrient-dense interventions. Family practices, intergenerational food norms, and caregiver preferences strongly influence children's dietary exposure, sometimes in conflict with therapeutic dietary recommendations. Interventions in schools rarely look at nutrition in a holistic manner; many ends up prioritizing either academic or clinical support over integration with diet and behavior. These realities make the need for Caribbean-specific research, to contextualize dietary interventions amidst socio-cultural norms, resource constraints, and perceptions by local caregivers, quite urgent. Moreover, findings from Western or East Asian studies have to be carefully adapted to align with Caribbean food availability, affordability, and health system limitations.

6. DISCUSSION

6.1 Integration of Findings with Global Literature

The findings from this systematic review indicate that dietary patterns, behavioral regulation, and cognitive functioning in autistic children are complexly interrelated in a number of multidimensional ways. Worldwide, evidence consistently shows that selective eating, nutrient deficiencies, and restricted diet are associated with behavioral dysregulation, such as increased irritability, emotional volatility, and sensory sensitivity (Cryan et al., 2019; Yap et al., 2024; Kang et al., 2019). Interventions that target the gut-brain axis include microbiota transfer therapy, probiotics, and prebiotics, which currently show promising improvements in both behavioral outcomes and cognitive performance, although the magnitude and consistency of such effects still remain variable. Indeed, such gains have been observed by Kang et al. (2020), Tan et al. (2021), and Pérez-Cabral et al. (2024). Notably, the improvements in mood, attention, and executive functions are often mediated through changes in gut microbial diversity, indicating that gut-brain communication is central to these outcomes. Reference may be made to work conducted by Di Benedetto et al. (2025) and Cryan et al. (2019).

While international studies have been important, divergence comes when considering socio-cultural and environmental concerns. Most the literature is placed in North America, Europe, and East Asia. Such locations reflect a supposedly high access to specialized nutrition services, clinical support, and educational interventions. In these contexts, adherence to a restrictive diet, such as a gluten- and casein-free regimen, may be feasible due to economic resources and parental knowledge (Di Benedetto et al., 2025). Caribbean contexts, such as St. Kitts and Nevis, pose unique challenges that have a fundamental impact on dietary practices and their

relationship with ASD outcomes. Food restriction among children often makes life very challenging for families because there is limited availability of nutrient-dense foods. Reliance on high-carb staples and intermittent access to imported fruits, vegetables, and specialty products prevail among them; see Elshamy et al. (2025); Nogueira-de-Almeida et al. (2025). The interplay between these structural constraints and intergenerational food norms, entrenched in cultural preference, may enhance selective eating behaviors and dampen the effectiveness of interventions extrapolated from a Western context. For instance, while North American studies may successfully implement a commercially available alternative to excluding dairy, a dairy-free diet, this could be neither supplied nor afforded by families in St. Kitts, thus requiring locally grounded adaptations (Yap et al., 2024).

Additionally, it is important to note that dietary interventions and their contributions to cognitive outcomes are highly interlinked with socio-environmental factors. Nutrient intake and variations in microbiota may impact attention, working memory, processing speed, and executive functioning (Li et al., 2024; Cryan et al., 2019). These, however, are mitigated by cultural norms, school meal structures, and home-based feeding practices that are varied and often very different across small island developing states (Elshamy et al., 2025; Mendive Dubourdieu & Guerendiain, 2023). Current literature, points to a clear need for culturally situated interpretations: dietary interventions cannot be generalized globally without consideration of economic realities, food traditions, and caregiver practices. The present review illuminates this gap, emphasizing that Caribbean-specific research is essential to contextualize diet–behavior–cognition relationships accurately.

6.2 Implications for Practice (Education, Clinical, Community)

Synthesis of international evidence through a Caribbean lens calls for nutrition-informed and behaviorally responsive interventions for children with autism. Schools, families, and clinical teams should be aware that eating is not solely about ingesting nutrients; it is also closely linked to behavioral self-regulation and cognitive functions (Cryan et al., 2019). The composition of multidisciplinary teams of dieticians, psychologists, occupational therapists, and educators will help in designing specific interventions that address sensory sensitivities, selective eating patterns, and learning difficulties in children with ASD(Tan et al., 2021).Sele, JP and Mukundi, MB (2023) in their work, “The Impact of Emotional Intelligence on Pedagogy: Fostering a Supportive Classroom Environment”, discussed school-based strategies that can include implementing flexible meal planning that caters for food selectivity while improving exposure to nutrient-dense options. For example, the inclusion of local foods that are familiar to the children, such as breadfruits, sweet potatoes, and fresh fish, in sensory-friendly preparations might allow gradual accommodation of varied diets and enhance mood regulation, along with cognitive engagement in various classroom activities (Mendive Dubourdieu & Guerendiain, 2023). Such approaches are important at a family level, too: caregivers need support through culturally adapted nutrition education, adaptation of recipes, and advice on how interventions might be embedded within typical household routines of Caribbean families (Elshamy et al., 2025). The reinforcement of dietary intervention through behavioral support can link positive reinforcement with actual eating behavior and self-regulation skills. Meanwhile, therapists can address the sensory hypersensitivities impeding food acceptance (Yap et al., 2024; Li et al., 2024) Further, community-based interventions-for example, local nutrition workshops, peer support groups, and collaboration with community health workers-may enhance the accessibility and sustainability of dietary strategies (Sele, JP; Mukundi, MB, 2024). Given the limitations of specialized services in St. Kitts and Nevis, utilizing schools, local clinics, and community centers has become of paramount importance when disseminating effective, feasible interventions that promote dietary adherence and behavioral/cognitive outcomes (Elshamy et al., 2025; Nogueira-de-Almeida et al., 2025).

6.3 Implications for Policy in St. Kitts and Nevis

The findings also highlight, from a policy perspective, major gaps in ASD services and nutrition support infrastructure. Despite increasing awareness of the gut–brain axis and the interplay between diet and behavior, national guidelines to integrate dietary management into ASD care in St. Kitts and Nevis do not exist. Context-specific ASD protocols for nutrition, behavioral support, and education accommodations should be developed and prioritized by policymakers. The guidelines for these accommodations should include access, cost, and training for caregivers, considering the socioeconomic challenges in developing small island states (Elshamy et al., 2025; Nogueira-de-Almeida et al., 2025).

Policy reforms may be needed to subsidize nutrient-dense foods, provide nutrition programs within school settings, and train health professionals in culturally sensitive dietary counseling. Furthermore, investment by the country into ASD screening and intervention services, including dietary evaluation, may decrease long-term behavioral and cognitive complications. Policymakers also need to address community partnerships with local farmers, food distributors, and educational institutions for assured access to fresh and culturally appropriate foods that would systemically support comprehensive ASD care. Yap et al., 2024; Pérez-Cabral et al., 2024.

6.4 Theoretical Contributions

This review places ecological systems frameworks and the gut-brain axis within Caribbean contexts to advance theoretical discourse. Such integration frames the importance of locating neurodevelopmental research in a range of sociocultural and economic contexts, as behaviors, nutrition, and cognition are intertwined. Cultural norms, food accessibility, caregiver practices, microbiota dynamics, and neurobiology mediate dietary interventions according to a Caribbean-informed model of diet-behavior-cognition. This approach accounts for the knowledge gaps in literature regarding ASD from around the world and focuses on the importance of contextualized research, thus promoting culturally adapted interventions and evidence-based approaches specific to developing small-island states (Cryan et al., 2019; Di Benedetto et al., 2025; Li et al., 2024).

This theoretical extension underscores interdependence between biological, psychological, and social elements regarding the consequences for autistic children. Situating ASD research within a Caribbean perspective will, therefore, enable scholars to elaborate on culturally situated models with the potential to inform clinical, educational, and policy practices at large. These findings will reinforce the notion that universal approaches to care for ASD are grossly inadequate and that only through lived experience, environmental constraints, and cultural realities can families have proper intervention (Mendive Dubourdieu & Guerendiain, 2023; Elshamy et al., 2025).

7. CONCLUSION

This systematic review highlights the intricate interaction of dietary patterns, behavioral regulation, and cognitive functioning in autistic children, with a particular emphasis on St. Kitts and Nevis. It is obvious from the literature around the world that emotional dysregulation, sensory sensitivity, and deficiencies in attention, executive functioning, and learning behaviors are significantly associated with selective eating, restricted dietary patterns, and nutrient imbalances (Cryan et al., 2019; Yap et al., 2024; Kang et al., 2019). Two such interventions targeting the gut-brain axis include microbiota transfer therapy and probiotic and prebiotic supplements, which have shown promising but inconsistent improvements in behavioral and cognitive outcomes (Tan et al., 2021; Pérez-Cabral et al., 2024).

However, these findings underscore an important limitation: most of the research emanates from high-income Western or East Asian contexts, leaving SIDS such as St. Kitts and Nevis virtually unrepresented. ASD children in the Caribbean face sociocultural, economic, and environmental challenges that, in turn, impinge directly on dietary patterns and, consequently, behavioral and cognitive development. Local approaches to food preparation, use of starchy staples, periodic shortages of fresh produce, and very limited access to specialized nutrition services combine to create an environment wherein global dietary interventions cannot immediately be applied. It is within these contextual realities that the development of interventions becomes both feasible and culturally relevant (Elshamy et al., 2025; Mendive Dubourdieu & Guerendiain, 2023).

The review also underlines the critical importance of a multidisciplinary approach that unites education, clinical care, and community involvement. Schools, families, healthcare providers, and policy makers all need to collaborate on nutrition-based interventions addressing the behavioral and cognitive needs of children with autism. Family-centered education may help bridge the gap between international evidence and local applicability, while school-based nutrition programming and community support initiatives can establish environments that foster holistic development. These aspects will be discussed further by Li et al. (2024) and Nogueira-de-Almeida et al. (2025).

This review thus represents a critical need from a policy and theoretical standpoint for the inclusion of dietary assessment, intervention, and education within a model of standard care encompassed within national ASD guidelines in St. Kitts and Nevis. These findings thus underscore the need for a Caribbean-informed model of diet behavior cognition, which may include gut-brain axis theory, ecological systems perspectives, and the sociocultural realities of small island developing states. This not only furthers the global discussion of ASD, but it has also yielded actionable insights with which culturally sensitive, context-specific interventions can be advanced.

In conclusion, evidence to date indicates that diet in autism is much more than a nutritional issue; it is a foundational factor affecting behavior, cognition, and life quality. Translation of this knowledge into culturally appropriate, practical strategies presents a unique opportunity to enhance outcomes for autistic children in St. Kitts and Nevis and other Caribbean countries. Indeed, future efforts can equip families, educators, and clinicians to create the environments in which autistic children will flourish cognitively and emotionally as part of the rich and vibrant tapestry of Caribbean life by aligning global research with local realities.

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