



A Review of the Effectiveness of Various Diet types on Autism

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Abstract: *A wide range of disorders with aberrant brain function include autism. The kind and severity of this illness vary widely. The first two years of a child's life are when symptoms are typically noticed. Communication problems, as well as social and behavioral activities, are caused by the disease group. This review article is based on searching open-access articles using medical subject heading (MeSH) medical subject heading words in the form of keywords. These are 'Autism diet types,' 'Autism,' and 'autism spectrum disorders.' The papers considered from 2000 till 2022 are only those already published and available in open-access databases, that is, Directory of Open Access Journals, PubMed, Google Scholar, Semantic Scholar, etc. To enhance their quality of life and stop their existing condition from getting worse, people with autism spectrum disorder (ASD) should be attentive to what they eat. Nutrition can frequently provide relief for ASD patients who have digestive problems. The usefulness of various diets for people with ASD must be further studied.*

Keywords: *Autism Spectrum Disorders, Autism Diet, Children's Behavior, Nutrition, Diet Types.*

1. INTRODUCTION

Autism, also called spectrum disorders (ASD), accounts for various conditions related to abnormal brain function. There are many variations in the severity and type of this disease. Such a diverse disease group is responsible for communication difficulty, including social and behavioral activities. There is a malfunction in performance from one action to the following scheduled activities of the subject. It is a neurodegenerative disorder that primarily affects children in learning, behaving, communicating, and interacting. The symptoms are mainly observed within the first two years of a child's life. [1]

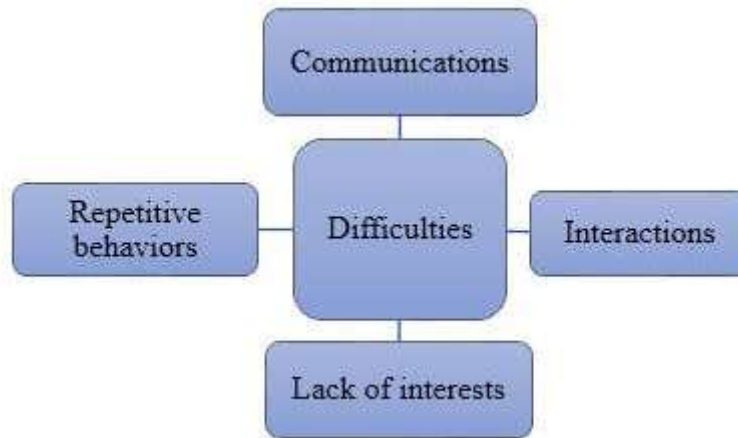


Fig.1. various difficulties of ASD children leading to improper behaviors [2]

Autism is one of the significant health issues in many countries, mainly Asia (Qatar, UAE, Bahrain, Oman), apart from Sweden, Australia, India, and many more countries. Autism is a dual burden for rural children in India and other developing countries because undernutrition is one of the significant public health concerns for developing nations like India. In most states, children under five who live in urban and rural areas struggle with undernutrition. Data on nutrients from the Estimated Average Requirement (EAR) have also been chosen by the needs of Indian children aged 0 to five. A proper diet through high protein meals is recommended apart from multivitamins and minerals for undernutrition autistic children. [2],[3]

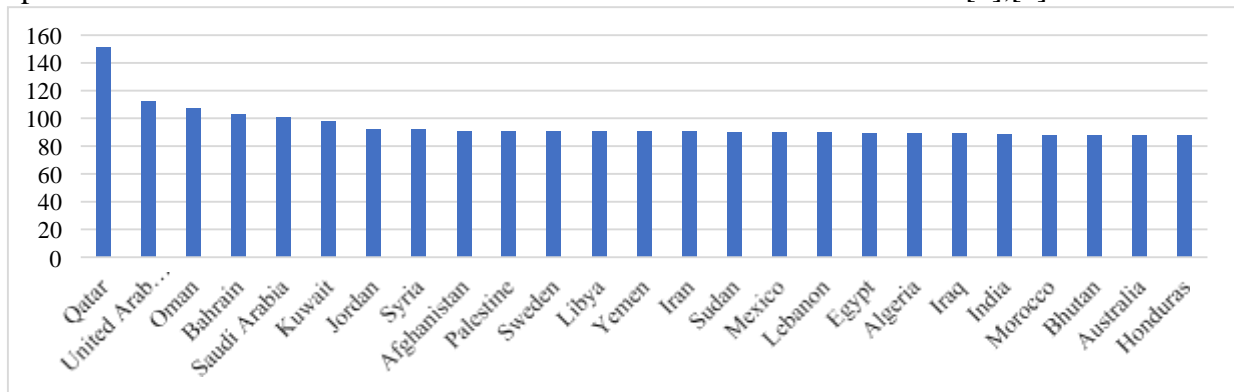


Fig.2. Prevalence status of ASD in first 25 countries out of 10000 persons [4]

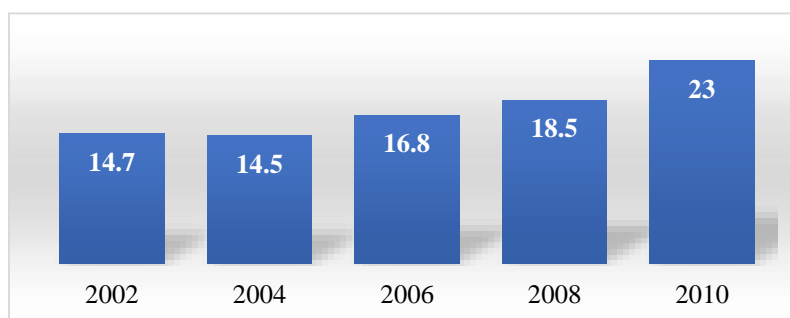


Fig.3. Combined prevalence per 1000 children [5]



Symptoms, diagnosis, and risk factors

Some people without ASD might also have some of these symptoms or even all of them. People with ASD may also have different ways of learning, moving, or paying attention. Some typical signs of autism spectrum disorders include anxiety, epilepsy, depression, and trouble sleeping (ASD). ASD can be diagnosed at 18 months or after 24 months (2 years) by a qualified and experienced neuropsychiatrist. Many people remain untreated and attend to receive medication with proper counseling until adulthood or older. Disorders known as autistic spectrum disorders (ASD) are thought to be brought on by various environmental, biological, and genetic factors. People with ASD have different treatment needs and distinctive strengths and challenges. The goal of current treatments is to lessen symptoms that affect daily life and quality of life. [1],[5]

Screening and care

Effective communication and social interaction in autistic children can be improved with timely access to evidence-based psychosocial interventions. It is advised to regularly monitor a child's development as part of maternal and child health care. Once autism has been identified, it is crucial to provide children, teenagers, and adults with autism and their caregivers with pertinent information, services, referrals, and hands-on assistance. [1], [5]

2. METHODS

This review article is based on searching open-access articles using (MeSH) medical subject heading words in the form of keywords. These are ‘Autism diet types,’ ‘Autism,’ and ‘autism spectrum disorders.’ The papers considered from 2000 till 2022 are only those already published and available in open-access databases, that is, Directory of Open Access Journals, PubMed, Google Scholar, Semantic Scholar, etc.

3. RESULTS

Autism spectrum disorder (ASD) sufferers should be mindful of their diet to improve their quality of life and prevent the deterioration of their current condition. Patients with ASD who experience gastrointestinal issues can often find relief through nutrition. To demonstrate the effectiveness of different diets for people with ASD, more research is required. However, in this article, only the four effective diet patterns found to be most discussed and favored by the respective authors have been considered.

Table.1 Four remarkable studies on diet patterns’ effectivity on Autism children. [14-18]

Authors and year	Study group	Recommended dietary intervention	Observation and Results
Ristori et al., 2019	(1) Observational prospective and retrospective studies, case-control studies, cohort studies, or systemic reviews; (2) gut microbiota profiles	Various dietary interventions like the Mediterranean, Keto, and Paleo Diets tested for Gastro Intestinal symptoms and the	Different diets significantly impact the composition of the gut microbiota, which are characteristics of ASDs. Different modulations of the



	and their metabolites in children (3) nutritional interventions or nutritional status on ASD patients;	behavioral affect patterns associated with ASD conditions.	host's tryptophan metabolism occur when 5'-HT levels rise. As a result, pro-inflammatory cytokines increased, linked to neurodevelopmental disorders and impaired social communication.
Konstantynowicz et al 2012	Children with ASD had three times higher plasma oxalate levels and 2.5 times higher urinary oxalate concentrations.	Plasma oxalate and spontaneous urinary calcium oxalate (CaOx) crystallization in 36 children and adolescents with ASD. Overall low-oxalate diet may be an effective alternative.	The pathogenesis of ASD in children may involve hyperoxalemia and hyperoxaluria. This may affect the CNS in autistic youngsters. This is the first account of plasma and urine oxalate in autistic children.
Al-Ayadhi and Elamin 2013	Camel milk is highly effective due to Iron, calcium, and vitamin C. They neutralize enzymes and are effective against a wide range of diseases because of antibodies IgM, IgG, IgA, and IgD	The study (Double-blinded, randomized clinical trial - RCT) included sixty ASD participants (2-12 years) who were allergic or food intolerant. Camel milk got n = 24; n = 25 received camel milk after the boil, and cow milk as a placebo, n = 11.	By altering the amounts of antioxidant enzymes and nonenzymatic antioxidant molecules, camel milk has been found to lower oxidative stress indicators and treat autism spectrum disorders (ASD). To determine if camel milk lessens oxidative stress in an ASD patient, larger-scale research activities are necessary.
Suskind et al. 2014	In this study, a special carbohydrate diet (SCD) has helped the child grow, lessened gastrointestinal issues, and enhanced social skills. It is altogether beneficial for ASD children.	Retrospective evaluations were conducted on children with Crohn's disease receiving the SCD without any immunosuppressive drugs. The diet therapy was administered for an	According to researchers, children with Crohn's disease may benefit therapeutically from a low-complex special carbohydrate diet (SCD). Additional prospective studies are necessary to evaluate the safety and



		average of 8 months, but it could last up to 30 months. The diet's start revealed that all symptoms had significantly disappeared.	effectiveness of the SCD or any other low-complex SCDs.
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4. DISCUSSIONS

Adjusting to new foods and rules regarding food presents the most significant difficulty for Asperger syndrome (ASD) and autistic children. According to Dawson et al., children with autism and ASD prefer nutrient-poor, high-calorie foods and avoid whole grains, vegetables, and fruits. To help prevent these issues, parents must start teaching these kids healthy eating habits as soon as they are weaned from their mothers' milk. [6]

An autistic child was given a therapeutic carbohydrate-restricted or keto diet in a 2018 study by Zarnowska et al., and the results showed significant clinical improvements in things like attention span and communication skills as a decrease in fear, anxiety, and emotional disturbances. They attributed the alterations in personality and behavior to diminished mitochondria gene expression and electron chain activity. [7]

Various multivitamins and minerals perform biochemical enzymatic reactions in the human body, functioning as neurotransmitters cum co-enzymes. Impaired metabolic functioning can be brought on by low vitamin and mineral levels or their complete absence. The supplements had fewer side effects that may affect the level of glutathione, methylation, biotin, and production of adenosine triphosphate.[8]

In 1980, the diet without gluten was conducted and was just recently rediscovery. Studies showed that foods containing gluten and casein might raise the formation of peptides because of crossing the blood-brain barrier due to the "leaky gut" condition in autism and ASD. [9]

For lactose intolerant ASD patients who lack energy or protein in their bodies, the peptide-protein powder might be a good substitute. According to Banerjee 2022, the nutritional and herbal supplements market will reach 140 billion dollars by 2030. Some people support using natural supplements that are frequently used without knowledge of their benefits, risks, or combinations with other medications. [10]

Eliminating foods like corn, millet, and sorghum, which cause immunoreactivity, is another goal of the Paleo diet, in addition to cutting out dairy and gluten. Enzymes called disaccharidases to convert complex sugars into simple sugars (like lactose) so that the intestine can absorb the nutrients. Various gastrointestinal symptoms, including gut dysbiosis, are brought on by a deficiency of these enzymes in the duodenum. There are some controversies that autism is a genetic and sometimes a metabolic disease, as per published literature. Some research showed that immunogenic toxins are known as lipopolysaccharides (LPS). LPS has been linked to obesity and insulin resistance, according to studies. The integrity of the intestinal epithelium's tight junctions can change due to gut dysbiosis. There is a correlation or close link between diabetes with ASD. Insulin resistance and type II Diabetes are the results of persistent insulin activity. Inulin, a prebiotic supplement found in chicory root, has enhanced probiotic absorption in humans and rats. The levels of additional vitamins and minerals in the rat and



human brains were also improved by increased inulin consumption. Several readily accessible sources of inulin include the Jerusalem artichoke, jicama, bananas, and dandelion root. [11,18] According to reports, the Mediterranean diet (MD) helps prevent disorders of the cardiovascular system, metabolism, and mind. Fruits, vegetables, legumes, nuts, grains, olive oil, fish, and alcohol are all included in MD. Low red meat, sweets, and saturated fat consumption are also linked to MD. [12,18]

The perception of working parents must be a significant concern when managing their children's health. Banerjee et al. (2022) conducted a study to understand better how parents view their children's eating and exercise habits. Parental knowledge of nutrition, parental attitudes toward telemedicine, perceptions of underweight, overweight, and diabetes, and diet counseling were all taken into consideration. [13]

5. CONCLUSIONS

People with autism spectrum disorder (ASD) should be mindful of their food to improve their quality of life and prevent the deterioration of their condition. Patients with ASD often experience digestive issues, which nutrition might help treat. To demonstrate the efficacy of different diets for people with ASD, more research is required.

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