JOURNAL OF MULTIDISCIPLINARY SCIENCES AND INNOVATIONS
GERMAN INTERNATIONAL JOURNALS COMPANY
ISSN: 2751-4390
IMPACT FACTOR (RESEARCH BIB) : 9,08. Academic research index

THE IMPACT OF CELIAC DISEASE ON GROWTH AND DEVELOPMENT IN CHILDREN

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Abstract: Celiac disease is a chronic immune-mediated enteropathy triggered by gluten in genetically predisposed individuals. In children, the condition is of particular concern as it impairs nutrient absorption during critical periods of physical and cognitive development. This article comprehensively explores the impact of celiac disease on pediatric growth, musculoskeletal formation, neurological function, and emotional stability. It discusses pathogenesis, clinical manifestations, diagnostic strategies, and the transformative role of a gluten-free diet. The study emphasizes early diagnosis, long-term dietary compliance, and a multidisciplinary management strategy.

Keywords: Celiac disease, gluten, growth delay, child development, gluten-free diet, malabsorption, pediatric nutrition.

Contents

1. Introduction

Celiac disease (CD) is a multisystem autoimmune disorder that primarily affects the small intestine in response to gluten ingestion. In children, undiagnosed or unmanaged CD can significantly impair growth and development, leading to long-term consequences such as stunted height, bone deformities, and cognitive delays. The increasing prevalence of CD globally, particularly among children, highlights the importance of early recognition and management.

2. Etiology and Pathogenesis

Celiac disease is genetically linked, with HLA-DQ2 and HLA-DQ8 haplotypes present in over 95% of affected individuals. Upon ingestion of gluten, gliadin peptides are deamidated by tissue transglutaminase (tTG), enhancing their affinity to HLA molecules. This triggers T-cell-mediated inflammation, leading to villous atrophy, crypt hyperplasia, and intestinal permeability. The resulting mucosal damage causes impaired absorption of essential nutrients critical for growth.

3. Clinical Manifestations in Children

Symptoms in children may vary by age:
- Infants: Chronic diarrhea, failure to thrive, abdominal distension
- Toddlers: Irritability, anorexia, delayed speech
- School-aged children: Short stature, delayed puberty, learning difficulties

Extraintestinal signs include iron-deficiency anemia, dental enamel defects, dermatitis herpetiformis, and neurobehavioral disturbances.

4. Diagnostic Criteria and Monitoring

Diagnosis includes:
- Serological testing: Anti-tTG IgA and EMA are gold-standard tests.
- Endoscopic biopsy: Confirms villous atrophy using Marsh classification.
- Genetic testing: HLA-DQ2/DQ8 genotyping for unclear cases.
- Anthropometry: Routine tracking of height-for-age, weight-for-age, and BMI percentiles.
- Nutrient profiles: Iron, vitamin D, folate, and zinc assessments.

5. Impact on Growth and Development

Due to nutrient malabsorption, CD can cause:
- Linear growth retardation (height-for-age below 3rd percentile)
- Weight stagnation or loss
- Delayed bone age and low bone mineral density
- Impaired psychomotor development and cognitive delays
- Increased risk of depression and anxiety

Untreated CD during growth years may result in permanently stunted adult height and skeletal immaturity.

6. Role of Gluten-Free Diet in Recovery

A lifelong, strict gluten-free diet (GFD) is the only effective treatment. Clinical improvements are usually seen within months:
- Growth parameters normalize in 6–12 months
- Gastrointestinal symptoms resolve quickly
- Hematological markers recover (Hb, ferritin)
- Neurodevelopmental progress resumes

Nutritional counseling and supplementation (iron, calcium, vitamin D) are essential for full recovery.

7. Regional Challenges and Recommendations

In developing regions like Central Asia:
- Gluten-free food availability is limited and costly
- Public and professional awareness is low
- Screening programs are not yet standardized

Recommendations:
- Introduce affordable gluten-free food alternatives
- Implement school health screening
- Train pediatricians in early recognition of CD

- Encourage public education and food labeling policies

8. Conclusion

Celiac disease has a profound and multifaceted impact on the health of children. Timely diagnosis, rigorous dietary compliance, and ongoing multidisciplinary support can reverse growth failure and allow children to achieve normal development milestones. A comprehensive public health approach is needed to improve early detection and management, particularly in under-resourced settings.

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