

# The Diagnosis of Patients with Celiac Disease and Calcium Deficiency

Ilinca Maria Abrudan<sup>1</sup>, Beatrice Kelemen<sup>1</sup>, Ana Maria Girbovan<sup>2</sup>, Carmen Viorica Abrudan<sup>3</sup>, Corina Crisan<sup>3</sup>, Genel Sur<sup>4</sup>, Gabriel Samasca<sup>5,\*</sup>

<sup>1</sup>Department of Molecular Biology, Faculty of Biology, Babes-Bolyai University Cluj-Napoca, Romania

<sup>2</sup>Department of General Medicine, Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania

<sup>3</sup>Medical Laboratory Analysis, Children Emergency Hospital, Cluj-Napoca, Romania

<sup>4</sup>Department of Pediatrics II, Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania

<sup>5</sup>Department of Immunology, Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania

\*Corresponding author: Gabriel.Samasca@umfcluj.ro

**Abstract** Our immunological system is every day under threat from different bacteria, viruses and disease. One of those many diseases is celiac disease. Once this disease affects the metabolism, it produces an imbalance of the electrolyte in blood. Therefore diagnostic tests are very important.

**Keywords:** bone metabolism, celiac disease, diagnostic tests

**Cite This Article:** Ilinca Maria Abrudan, Beatrice Kelemen, Ana Maria Girbovan, Carmen Viorica Abrudan, Corina Crisan, Genel Sur, and Gabriel Samasca, "The Diagnosis of Patients with Celiac Disease and Calcium Deficiency." *International Journal of Celiac Disease*, vol. 4, no. 1 (2016): 16-18. doi: 10.12691/ijcd-4-1-3.

## 1. Introduction

Celiac Disease (CD) is a chronic inflammatory autoimmune disease which consists in changes of the small intestinal mucosa due to gluten intolerance. But to some patients the gradual destruction is more and more severe and it moves to the distal part of the small intestine, and in much severe cases the lesion spreads to the last section of the small intestine, respectively the ileum and to the middle fragment of the large intestine, respectively the colon [1,2]. Gluten is a protein from cereals mostly common in wheat and contains carbohydrates and lipids [3]. Gluten is an albuminoid elastic substance, gray, thick and lax, which is made up from a mixture of gliadin and glutenin [4]. Gluten is also found in rye and barley.

CD has different manifestations from patient to another patient, these differences appear depending on age, length of time and the stage of the disease. Some of the symptoms that manifest in children, adolescent and adults are: diarrhea, nausea, constipation, muscle cramps, weight loss, resting, low height, muscle weakness and they are easily irritable and sad. Some researchers unveil hypocalcemia as a first symptom at an adolescent with an untreated CD [5]. But in the bone metabolism, besides the symptoms from up above the patient presents also: low amounts of vitamin D, low mineral bone density, low bone mass and bone fragility. CD may also affect any organ and tissue without the presence of any symptom; it can grow outside the intestinal area [6].

The diet of a patient diagnosed with CD is one without gluten. The patient must always avoid wheat products, barley and raw. This gluten-free diet (GFD) must be kept the whole life, it plays a very important role in the bone

mineralization. The gluten-free products have a very small amount of nutrients, vitamin (B and D) and minerals, including calcium (Ca), iron (Fe), zinc (Zn) and magnesium (Mg). Ca is an essential ion and vital to keep the main functions and neuromuscular circulators; it is a cofactor for some of the hormones and enzymes that affect the immune system. In bones and teeth, Ca plays a very important structural role [7,8]. GFD is an interdisciplinary problem for both society and family. Therefore the research is being made to discover wheat with small degree or even null properties that can cause poisoning in patients diagnosed with CD [9]. Patients, who don't follow GFD usually present: skeletal disorder, fragile bones that lead to fractures most often and osteoporosis. Osteoporosis is a common disease distinguished by reduced bone strength, which develop the multiple fracture risk [8].

Therefore, the faster the diagnosis of a patient is made, the better they can improve their lifestyle. We established from the start, that our aim was to do a review study of the literature on the main immunological test diagnosis in association with CD and Ca deficiency.

## 2. Materials and Methods

We made a literature review with articles from PubMed database, using "celiac disease" and "calcium" as keywords. We took into consideration only relevant articles in which was presented the link between CD and Ca deficiency.

## 3. Results

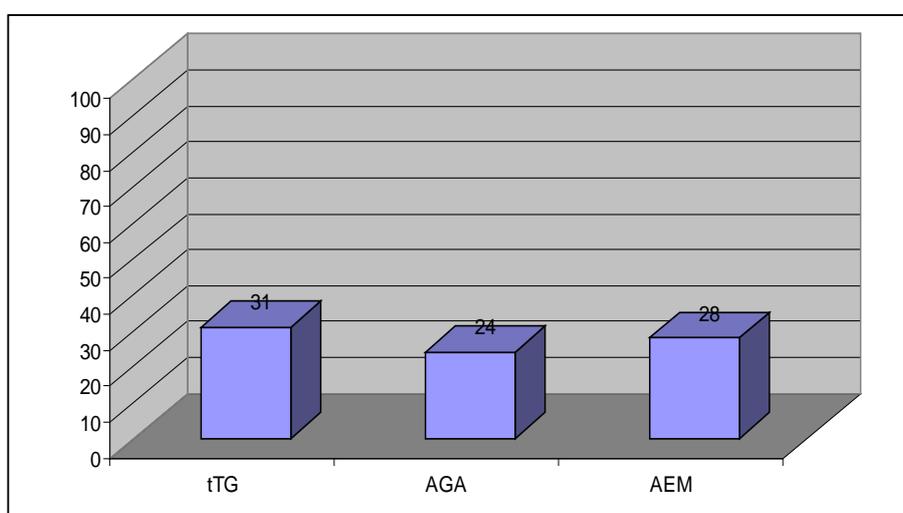
We found 97 articles about the association between CD and calcium deficiency. The articles contained a total of

156 evaluation and diagnostic tests of the connection between CD and Ca deficiency. Dividing them into big categories, we identified the following types: ELISA, IFA, biochemical tests, chemiluminiscence, endoscopy, BMD,

absorptiometry and other tests (Table 1). The diagnosis tests for CD revealed a tTG use in most of the cases (Figure 1).

**Table 1. The main types of diagnostic tests identified**

ELISA for AGA, tTG	55	35%
IFA for AEM	28	18%
Biochemical tests for CA	3	2%
Chemiluminiscence for PTH, IGF1, cortisol	7	4%
Endoscopy	27	17%
BMD	16	10%
absorptiometry	19	12%
Alte teste: tomography of the distal radius and tibia	1	2%
Total	156	100%



**Figure 1.** Diagnostic tests in celiac disease

## 4. Discussion

From the presented data it can be observed how important is a precise diagnosis in CD associated with Ca deficiency. First of all, the serological markers for CD are anti-endomysium (AEM) and antibodies transglutaminase tissue (tTG), which have a higher sensitivity and specificity than anti-gliadin antibodies (AGA). But although AGA shows low sensitivity and specificity, from Table 1 we see that AGA is still used in CD screening. If the result is positive for the serological test and there are suspicions of CD from medical point, then the patient will do an endoscopy and a biopsy of the small intestine [10].

Tissue transglutaminase (TG2) is an enzyme that is able to increase the immunological stimulation to gluten and to autoantigen that is the target to the immune response. The tissue transglutaminase autoantibodies own a higher specificity and sensitivity in CD [11]. There are several ways to determine this autoimmune disease. ELISA for tTG is a method that is much easier to use and cheaper than the indirect immunofluorescence for AEM method, although the last method has a higher-level specificity. tTG is a method which presents an upper sensitivity and that's why it is recommended for the screening of CD. If tTG are positive then AEM is a confirmatory test for tTG and for a positive result confirmation it is also

recommended to do an intestinal biopsy. The advantages using AEM include higher specificity related with the degree of the villi damage, this can lead up to the development of CD, found in low concentrations in patients with a normal histology of the intestinal mucosa [12].

For the most people that are suspected for calcium deficiency in CD, the person is supposed to submit for (undergo some) medical tests. Calcium is tested in blood. There were found differences between calcemic levels in patients with CD at the beginning compared to patients with confirmed CD [13]. Besides primary and secondary hypocalcemia, the renal insufficiency is evaluated, vitamin D intoxication and Paget disease. We haven't found any information about bone biopsy usage in literature, which is in accordance with the fact that it is rarely used in medical practice. But this helps very much at diagnosing it. At an evaluation of the renal osteoporosis, a bone biopsy can make the difference between a higher or a lower scale of bone disease [14].

## 5. Conclusions

This disease is a problem that affects the small intestine. The fact that the patients must follow a GFD, helps them to maintain a better lifestyle. But if the patients

presents a small amount of electrolyts, in special Ca, prevails the risk for osteoporosis. Therefore, exploring bone metabolism is an important issue in CD. Knowledge of diagnostic tests in this association is also helpful.

## Abbreviations

ELISA - The enzyme-linked immunosorbent assay; IFA - Immunofluorescence Antibody Assay; BMD – bone mineral density; PTH – parathormon; IGF1 - Insulin-like growth factor 1

## References

- [1] Krupa-Kozak U. Pathologic bone alterations in celiac disease: Etiology, epidemiology, and treatment. *Nutrition* 2014;30:16-24.
- [2] Korkmaz HA, Dizdärer C, Ecevit CO. Hypocalcemic seizure in an adolescent with Down syndrome: a manifestation of unrecognized celiac disease. *Turk J Pediatr* 2013;55:536-538.
- [3] Nenişescu CD. (1980) *Chimie organică (volumul II)*, Editura Didactică și Pedagogică, Bucureşti.
- [4] Chioreanu A, Radulescu G. (1972) *Mic Dicţionar Enciclopedic*, Editura Enciclopedică Română, Bucureşti.
- [5] Caurin Saboya MB, Bonastre Blanco E, Roca Martinez J, Casano Sancho P, Pou Fernández J. Hipocalcemia sintomática como primera manifestació de enfermedad celica en un adolescente. *An Pediatr (Barc)* 2011;75:425-426.
- [6] Sharma M, Singh P, Agnihotri A, Das P, Mishra A, Verma AK, Ahuja A, Sreenivas V, Khadgawat R, Gupta SD, Makharia GK. Celiac Disease: a disease with varied manifestations in adults and adolescents. *J Dig Dis* 2013;14:518-525.
- [7] Agardha D, Rothc B, Lernmarkb A., Stenberg P. Calcium activation of tissue transglutaminase in radioligand binding and enzyme-linked autoantibody immunoassays in childhood celiac disease. *Clin Chim Acta* 2005;358: 93-103.
- [8] Garnier-Lengliné H, Cerf-Bensussan N, Ruummele FM. Celiac disease in children. *Clin Res Hepatol Gastroenterol.* 2015;39: 544-551.
- [9] Samaşca G, Sur G, Lupan I, Deleanu D. Gluten-free diet and quality of life in celiac disease. *Gastroenterol Hepatol Bed Bench* 2014;7: 139-0143.
- [10] Schuppan D, Zimmer KP. The Diagnosis and Treatment of Celiac Disease. *Dtsch Arztebl Int* 2013;110:835-846.
- [11] Samaşca G, Pârvan A, Farcău D, Dejica D. Anticorpii antitransglutaminază tisulară. *Practică medicală* 2010;5:88-91.
- [12] Samaşca G, Iancu M, Farcău D, Butnariu A, Pop T, Pîrvan A, Andreica M, Miu N, Cristea V, Dejica D. IgA anti-tissue transglutaminase antibodies, first line in the diagnosis of celiac disease. *Clin Lab* 2011;57:695-701.
- [13] Samaşca G, Nechit R, Ponta M, Iancu M, Butnariu A, Farcău D, Andreica M, Dejica D. Statusul Nutriţional Biochimic la copiii cu boală celiacă, Cercetare clinică. *Clujul Medical* 2010;83:497-503.
- [14] Lewiwicki EM. (2015) Osteoporosis: Clinical Evaluation, In: De Groot LJ, Beck-Peccoz P, Chrousos G, Dungan K, Grossman A, Hershman JM, Koch C, McLachlan R, New M, Rebar R, Singer F, Vinik A, Weickert MO, editors. *Endotext* [Internet]. South Dartmouth (MA): MDText.com, Inc.