

## Original Research Article

## Hematological profile of children with celiac disease at diagnosis

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## Abstract

**Background:** Anemia is a common manifestation of CD, sometimes being the only presenting feature. Hence we decide to study the occurrence of anemia and detailed hematological profile of children with celiac disease at the time of initial diagnosis. **Methods:** The Cross Sectional Observational Study was conducted in Children between the age group of 2-16 years with newly diagnosed celiac disease. Age and sex matched controls were enrolled. Samples were analysed for hemoglobin levels, platelet count, RBC indices, Iron profile, Serum Folic acid and Vitamin B12 levels. **Results:** The cases had significantly lower mean levels of hemoglobin ( $8.71 \pm 2.51$  g/dl) as compared to the controls ( $11.4 \pm 1.59$  g/dl) with a p value of  $<0.001$ . RBC indices like MCV, MCH, MCHC were also significantly lower (p value  $<0.001$ ) suggestive of hypochromia and microcytosis among the cases. The cases had significantly lower levels of serum iron ( $39.00 \pm 27.45$  µg/dl) and transferrin saturation ( $11.19 \pm 7.21\%$ ) as compared to controls ( $67.11 \pm 69.02$  µg/dl and  $27.55 \pm 13.34\%$  respectively) with a p value  $<0.001$ . Vitamin B12 and Folic acid levels were low in cases though not statistically significant (p value 0.114 and 0.051 respectively). **Conclusion:** A significant proportion of celiac patients have anemia and majority of them being associated with iron deficiency, serum iron levels and supportive homological monitoring should be done regularly in celiac patients starting right from the point of diagnosis.

**Keywords:** Celiac disease, iron profile, anemia

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## Introduction

Celiac disease is a systemic autoimmune disease elicited by gluten and related prolamines in genetically susceptible individuals. In children diagnosed within the first two years of life, intestinal symptoms are more common where as those diagnosed later in childhood or the asymptomatic patients diagnosed through a screening process, are most likely have extra intestinal manifestations. Extra intestinal manifestations are mainly due to nutrient deficiencies. Being primarily a disorder of mal-absorption, other aspects of nutrition and hematological indices also seem to be affected. Anemia is a common manifestation of CD, sometimes being the only presenting feature. [1] The most common symptoms seen in Indian children are stunting, seen in almost 100% of the patients, anemia (90-100%) and chronic diarrhea (88-94%) in that order. [2,3] Hence we decide to study the occurrence of anemia and detailed hematological profile of children with celiac disease at the time of initial diagnosis.

## Methods

The Cross Sectional Observational Study was conducted in the Department of Pediatrics from November 2015 to March 2017. Children between the age group of 2-16 years with the diagnosis of celiac disease (newly diagnosed) from children attending the Pediatric gastroenterology clinic, pediatric outpatient department were enrolled for the study group. Age and sex matched children coming for routine vaccinations, minor afebrile illnesses and healthy siblings of the cases were enrolled for the control group. Children diagnosed with any known hematological diseases or those who have received vitamin and iron supplementation in previous 3 months were excluded from the study. Informed written

consent was taken from all the participants before the enrollment. After enrollment, venous blood samples were collected in appropriate collection vials and the same were assessed as follows. Samples collected in an EDTA vials were analysed by automated hematology analyzer to measure hemoglobin levels, platelet count and RBC indices. Serum obtained from the samples were analysed for estimation of Iron profile by Calorimetric methods. Serum Folic acid and Vitamin B12 levels were measured using Chemiluminescence method. The laboratory values were assessed according to standard reference values for age and sex and the results between the two groups were compared. [4,5]

## Results

The cases and the controls differed significantly from each other with regard to many laboratory parameters. The cases had significantly lower mean levels of hemoglobin ( $8.71 \pm 2.51$  g/dl) as compared to the controls ( $11.4 \pm 1.59$  g/dl) with a p value of  $<0.001$ . RBC indices like MCV, MCH, MCHC were also significantly lower (p value  $<0.001$ ) suggestive of hypochromia and microcytosis among the cases. The cases had significantly lower levels of serum iron ( $39.00 \pm 27.45$  µg/dl) and transferrin saturation ( $11.19 \pm 7.21\%$ ) as compared to controls ( $67.11 \pm 69.02$  µg/dl and  $27.55 \pm 13.34\%$  respectively) with a p value  $<0.001$ . Vitamin B12 and Folic acid levels were low in cases though not statistically significant (p-value 0.114 and 0.051 respectively). Among the celiac cases, 86.1% had anemia for age and 36.1% had thrombocytosis. Among the children with anemia, 35.5% had low serum iron levels, 9.7% had low serum vitamin B12 levels and 9.7% had low serum folic acid levels.

## Discussion

86.1 % of our cases were anemic compared to 66.7% of the controls with a significant difference between the mean values of hemoglobin, MCV, MCH, MCHC, serum iron, TIBC and TIBC saturation between the two groups. 86.1% of the cases had microcytosis and 75% had hypochromia which was significantly more compared to controls, among whom only one third were found to have microcytic hypochromic blood picture. It was also

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noted that around one third of the cases had decreased serum iron levels while more than 80% of the cases had decreased TIBC saturation, a proportion significantly more than the controls (p value <0.001), suggesting high prevalence of microcytic hypochromic anemia with most likely iron deficiency as the cause among the celiac patients. 13 (36.1%) of our cases also showed thrombocytosis as compared to 8.3% of the control subjects (p value 0.009). none of our patients had macrocytosis suggestive of vitamin B12 or Folic acid deficiency. The study done by Dickey et al. [6] stated 24% of the study subjects to be anemic. Similarly, many other previous studies have also demonstrated the association of celiac disease with iron deficiency anemia, thrombocytosis and vice versa and our findings are in accordance with them. [7-10] Many studies in the past have enforced that most of

the CD patients with anemia have iron deficiency with microcytic hypochromic anemia. Megaloblastic anemia occurs rarely even with low levels of serum folate and vitamin B12.[6,11] In a study by Manzanares et al.[7] 80% of cases had microcytic hypochromic anemia and 20% had dimorphic anemia. Iron deficiency may be found in celiac disease patients even in the absence of gastrointestinal manifestations.[10] Deficiency mainly results from impaired absorption and increased loss of iron in the bowel enterocytes or from occult GI blood loss.[12,13] Incidence of celiac disease in patients with IDA is reported to vary from 2-15%.[10,14-16] On the other hand, Celiac disease prevalence may be as high as 44% in children with refractory iron deficiency anemia and thus should be considered in every children with IDA, particularly those with refractory IDA.[17]

**Table 1: Laboratory parameters, cases and control**

Laboratory Parameter	Cases	Controls	P value
	Mean $\pm$ SD	Mean $\pm$ SD	
Hemoglobin (g/dl)	8.71 $\pm$ 2.51	11.4 $\pm$ 1.59	<0.001
Platelets (cells/cumm)	3.84 $\pm$ 1.48	2.73 $\pm$ 0.82	0.001
MCV (fl)	62.73 $\pm$ 12.29	78.68 $\pm$ 5.6	<0.001
MCH (pg)	19.27 $\pm$ 5.2241	26.49 $\pm$ 3.4	<0.001
MCHC (%)	29.79 $\pm$ 3.649	32.28 $\pm$ 2.03	<0.001
Total serum Iron ( $\mu$ g/dl)	39.00 $\pm$ 27.45	67.11 $\pm$ 69.02	<0.001
TIBC ( $\mu$ g/dl)	413.53 $\pm$ 84.12	338.03 $\pm$ 69.02	<0.001
Transferrin Saturation (%)	11.19 $\pm$ 7.21	27.55 $\pm$ 13.34	<0.001
Vit B12 (pg/dl)	327.11 $\pm$ 176.16	381.19 $\pm$ 153.51	0.114
Folic Acid (ng/dl)	5.96 $\pm$ 4.17	8.039 $\pm$ 5.4696	0.051

### Conclusion

A significant proportion of celiac patients have anemia and majority of them being associated with iron deficiency, serum iron levels and supportive homological monitoring should be done regularly in celiac patients starting right from the point of diagnosis. Also, children presenting with iron deficiency anemia alone should be screened judiciously for Celiac disease when warranted keeping a high index of suspicion.

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