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PREVALENCE OF COELIAC DISEASE IN PATIENTS WITH IRON DEFICIENCY ANAEMIA AT JINNAH POSTGRADUATE MEDICAL CENTER, KARACHI

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Abstract

BACKGROUND

Iron deficiency anaemia is the commonest nutritional anaemia worldwide and a frequent extra-intestinal presentation of coeliac disease, in which injury to the proximal duodenum impairs iron absorption. In Pakistan the condition is often overlooked in anaemic adults without diarrhoea, and local data on how often it underlies iron deficiency anaemia remain limited.

OBJECTIVE

To determine the frequency of coeliac disease in patients with iron deficiency anaemia and to compare demographic and haematological parameters between patients with and without coeliac disease.

METHODS

This cross-sectional study was conducted in the Department of Medicine, Jinnah Postgraduate Medical Centre (JPMC), Karachi, from November 2024 to May 2025. A total of 175 adults aged 20–60 years with established iron deficiency anaemia receiving iron therapy were enrolled using a non-probability consecutive sampling technique. Serum anti-tissue transglutaminase (anti-tTG) and anti-endomysial (EMA) antibodies were measured. Patients who tested positive for either serological marker underwent duodenal biopsy to confirm the diagnosis of celiac disease. Data were analysed using SPSS version 26.

RESULTS

The mean age was 34.34 ± 10.03 years and 107 (61.1%) patients were male. Coeliac disease was found in 23 (13.1%) patients (95% CI 8.9 to 18.9). Its frequency did not differ across age, gender, or duration of anaemia. Patients with coeliac disease had significantly lower mean haemoglobin than those without it (8.47 ± 1.25 versus 9.57 ± 1.17 g/dL; mean difference 1.10 g/dL, 95% CI 0.57 to 1.62; $p < 0.001$).

CONCLUSION

Coeliac disease underlay iron deficiency anaemia in about one in eight adults and was associated with deeper anaemia. Serological screening for coeliac disease is warranted in adults with iron deficiency anaemia, particularly when the anaemia

is disproportionate, so that timely diagnosis and gluten-free dietary treatment can be offered.

INTRODUCTION

Coeliac disease is a chronic immune-mediated enteropathy that develops in genetically predisposed individuals after the ingestion of gluten found in wheat, barley and rye [1]. Once considered uncommon outside Europe, it is now recognised across South Asia, with a pooled global seroprevalence near 1.4 percent and biopsy-confirmed disease in roughly 0.7 percent of the population [2]. Reported incidence has risen steadily over recent decades, in part through the wider use of sensitive serological tests [3]. The clinical picture is heterogeneous, ranging from classical malabsorption with diarrhoea and weight loss to minimally symptomatic or purely extra-intestinal forms, so that many adults remain undiagnosed for years [1].

Iron deficiency anaemia is the most common nutritional deficiency worldwide and accounts for about half of all anaemia [6]. It is also the most frequent extra-intestinal manifestation of coeliac disease, and in a substantial proportion of patients it is the only presenting feature [8]. The mechanism is anatomical, because gluten-driven injury is maximal in the proximal duodenum, the principal site of dietary iron absorption, so iron uptake is impaired even when oral supplements are given [9]. More than half of newly diagnosed patients are already iron deficient, and anaemia that fails to respond to oral iron is a recognised pointer to occult coeliac disease[8,9]. Because of this close link, international guidance recommends serological testing for coeliac disease in every adult with unexplained iron deficiency anaemia [4,6]. Diagnosis rests on positive anti-tissue transglutaminase and anti-endomysial antibodies, confirmed by duodenal biopsy showing the villous changes graded by the modified Marsh classification [5]. Pooled analyses place the frequency of biopsy-confirmed coeliac disease among patients with iron deficiency anaemia at around 3 to 5 percent in Western populations, although individual series report considerably higher figures [7].

Evidence from South Asia is comparatively sparse, and in Pakistan coeliac disease is frequently missed in anaemic adults who lack the classical gastrointestinal features, so that many receive repeated courses of iron without the underlying enteropathy ever being sought [11]. Reliable local estimates are needed to justify routine screening in this setting and to identify the patients most likely to benefit. The present study was therefore undertaken to determine the frequency of coeliac disease in patients with iron deficiency anaemia and to compare demographic and haematological characteristics between those with and without the disease.

METHODOLOGY

This cross-sectional study was conducted in the Department of Medicine, JPMC Karachi, from November 2024 to May 2025 after ethical clearance from the Ethics Review Committee of JPMC, Karachi and written informed consent was obtained from every participant before enrolment. Adults of either gender aged between 20 and 60 years who had established iron deficiency anaemia and had remained compliant with iron replacement therapy for more than one month were recruited through non-probability consecutive sampling. A patient was taken to have iron deficiency anaemia when documented anaemia was accompanied by at least three of the following: haemoglobin below 13 g/dL in men and below 12 g/dL in non-pregnant women (World Health Organization criteria), serum ferritin below 15 ng/mL, transferrin saturation below 15 percent, and mean corpuscular volume below 80 fL. Patients with overt gastrointestinal blood loss, pregnancy, chronic kidney, liver or obstructive pulmonary disease, recent myocardial infarction, decompensated cardiac failure, or critical illness were excluded. The sample size of 175 was based on an expected frequency of coeliac disease of 11.8 percent among patients with iron deficiency anaemia, a 95 percent confidence level, and an absolute precision of 5 percent [10]. Demographic details, duration of anaemia, and haematological indices were

recorded on a structured proforma by a single trained investigator. A venous sample was tested for anti-tissue transglutaminase and anti-endomysial antibodies, and seropositive patients underwent upper gastrointestinal endoscopy with biopsy of the second part of the duodenum by a single endoscopist. Coeliac disease was taken as positivity for both antibodies together with duodenal histology showing modified Marsh grade IIIa or above. Data were analysed using SPSS version 26; frequencies and percentages summarised categorical variables, continuous variables were expressed as mean and standard deviation or median and interquartile range, and coeliac disease was compared using the chi square test, Fisher exact test, independent samples t test and Mann Whitney U test, with a p value of 0.05 or less considered statistically significant.

RESULTS

A total of 175 patients with iron deficiency anaemia were studied. The mean age was 34.34 ± 10.03 years, and most patients were younger than 40 years. By age band, 68 (38.9%) patients were 20 to 30 years, 69 (39.4%) were 31 to 40 years, 22 (12.6%) were 41 to 50 years, and 16 (9.1%) were 51 to 60 years. Men predominated, accounting for 107 (61.1%) participants, while 68 (38.9%) were women. The median duration of iron deficiency anaemia was 2 years, and the majority had been anaemic for one to two years. For the whole cohort the mean haemoglobin was 9.43 ± 1.24 g/dL and the mean corpuscular volume 72.48 ± 4.91 fL, while the median serum ferritin was 5.50 ng/mL and the median transferrin saturation 5.90 percent, in keeping with the inclusion definition. Baseline characteristics are shown in Table I.

Coeliac disease was identified in 23 (13.1%) of the 175 patients, as presented in Table II. Anti-tissue transglutaminase antibody was positive in 29 (16.6%) patients and anti-endomysial antibody in 27 (15.4%). Among the confirmed cases, duodenal histology showed modified Marsh grade IIIa in 11 (6.3%), grade IIIb in 7 (4.0%), and grade IIIc in 5 (2.9%) patients.

The frequency of coeliac disease did not differ significantly across age groups, gender, or duration of anaemia, as detailed in Table III.

On comparison of the two groups, patients with coeliac disease had significantly lower mean haemoglobin than those without the disease, 8.47 ± 1.25 g/dL versus 9.57 ± 1.17 g/dL (mean difference 1.10 g/dL, 95% CI 0.57 to 1.62) ($p < 0.001$). Age, duration of anaemia, mean corpuscular volume, serum ferritin, and transferrin saturation were comparable between the two groups. These comparisons are summarised in Table IV.

Table I: Baseline Demographic and Haematological Characteristics of Participants (n=175)

Baseline Characteristics		
Age (years), **Mean ± SD**		34.34 ± 10.03
Haemoglobin (g/dL), **Mean ± SD**		9.43 ± 1.24
MCV (fL), **Mean ± SD**		72.48 ± 4.91
Duration of IDA (years)**, Median (IQR)**		2 (1 to 3)
Serum ferritin (ng/mL), **Median (IQR)**		5.50 (3.15 to 8.30)
Transferrin saturation (%), **Median (IQR)**		5.90 (3.65 to 7.95)
Gender	Male, n (%)	107 (61.1)
	Female, n (%)	68 (38.9)

Table II: Frequency of Coeliac Disease and Diagnostic Findings (n=175)

Findings		**n** (%)
Coeliac Disease	Present	23 (13.1)
	Absent	152 (86.9)
	Marsh IIIa	11 (6.3)

Duodenal biopsy	Marsh IIIb	7 (4.0)
	Marsh IIIc	5 (2.9)
Anti-tissue transglutaminase positive		29 (16.6)
Anti-endomysial antibody positive		27 (15.4)

Table III: Association of Coeliac Disease with Age, Gender and Duration of Anaemia

Stratum		CD present, n (%)	CD absent, n (%)	P-value
Age Group	20 to 30 years	9 (13.2)	59 (86.8)	0.985†
	31 to 40 years	10 (14.5)	59 (85.5)	
	41 to 50 years	2 (9.1)	20 (90.9)	
	51 to 60 years	2 (12.5)	14 (87.5)	
Gender	Male	13 (12.1)	94 (87.9)	0.626
	Female	10 (14.7)	58 (85.3)	
IDA	1 to 2 years	15 (14.7)	87 (85.3)	0.734
	3 to 4 years	6 (11.8)	45 (88.2)	
	5 to 6 years	2 (9.1)	20 (90.9)	

"CD, coeliac disease; IDA, iron deficiency anaemia. † Fisher Freeman Halton exact test (age, expected count below 5 in 25 percent of cells); gender and duration by Pearson chi square test. $p < 0.05$ considered significant."

Table IV: Comparison of Demographic and Haematological Parameters by Coeliac Disease Status

Parameter	CD present (n=23)	CD absent (n=152)	P-value
Age (years)	31.00 (29.00 to 37.00)	33.00 (26.75 to 40.00)	0.699
Duration of IDA (years)	2.00 (2.00 to 3.00)	2.00 (1.00 to 4.00)	0.884
Haemoglobin (g/dL)	8.47 ± 1.25	9.57 ± 1.17	<0.001
MCV (fL)	71.87 ± 5.28	72.57 ± 4.86	0.529
Serum ferritin (ng/mL)	6.00 (3.90 to 7.80)	5.30 (3.08 to 8.50)	0.947
Transferrin saturation (%)	5.30 (3.85 to 6.65)	6.00 (3.60 to 8.10)	0.235

"CD, coeliac disease; IDA, iron deficiency anaemia; MCV, mean corpuscular volume. Haemoglobin and MCV (normal) compared by independent samples t test and given as mean ± SD; age, duration, ferritin and transferrin saturation (skewed) compared by Mann Whitney U test and given as median (IQR). $p < 0.05$ considered significant."

DISCUSSION

Iron deficiency anaemia is one of the most frequent reasons for referral to a physician, yet the possibility that it signals underlying coeliac disease is often overlooked, particularly when the classical gastrointestinal features are absent [1,6]. Because the enteropathy of coeliac disease is concentrated in the proximal duodenum, where dietary iron is absorbed, anaemia may be the earliest and sometimes the only manifestation of the disease [8,9]. The present study set out to measure how often coeliac disease underlies iron deficiency anaemia in adults and to characterise the patients in whom it is found.

The cohort was relatively young, with a mean age close to 34 years, and men outnumbered women. This age pattern mirrors regional series of coeliac disease, in which most adults present in the third and fourth decades [16,17]. Coeliac disease was found in 13.1 percent of anaemic patients, a figure at the upper end of the international range. It is close to the 11.8 percent reported by Ackerman and colleagues in the study on which

the sample size was based [10], and to the 11 percent documented among Pakistani adults with iron deficiency anaemia by Khatoon and co-workers [11].

The frequency observed here exceeds the pooled estimate of biopsy-confirmed coeliac disease of around 3 to 5 percent derived from Western meta-analysis [7], and the 4.7 percent recorded in a United Kingdom primary care population [13]. It is, however, consistent with several studies of anaemia of obscure origin, including 10 percent from Isfahan [14], 14.6 percent from Tehran [15], and 8 percent from neighbouring Kashmir [16]. The higher yield in these regional series probably reflects both a genuinely greater burden in South Asian and Middle Eastern populations and the selection of patients whose anaemia had no obvious alternative cause.

Serological screening followed by duodenal biopsy remains the accepted diagnostic pathway, and every confirmed case in this study was positive for both anti-tissue transglutaminase and anti-endomysial antibodies with Marsh grade IIIa or above, in keeping with current diagnostic criteria [4,5]. The predominance of higher Marsh grades among the confirmed cases fits the observation that anaemia tends to accompany more extensive villous atrophy, since a greater length of damaged mucosa translates into poorer iron absorption [9].

The most notable finding was that patients with coeliac disease were more deeply anaemic than those without, with a mean haemoglobin 1.10 g/dL lower. A similar relationship was reported by Javid and colleagues from Kashmir, who found an inverse correlation between haemoglobin concentration and the severity of duodenal damage [16]. The value of recognising these patients is underlined by the response to treatment seen elsewhere, since haemoglobin rose substantially after six months of a gluten-free diet, even without iron supplementation, in both Iranian and Indian series [15,16]. Coeliac disease was distributed evenly across age, gender, and duration of anaemia, which suggests that screening should not be confined to any single subgroup [18].

The study used standardised case definitions, a single trained data collector, and a single endoscopist, which limited measurement variation. Several limitations should be acknowledged. The design was cross-sectional and single-centre, so the findings may not be generalisable to the wider population, and the modest number of confirmed cases limited the power of the stratified comparisons. Serology-guided biopsy may also have missed the occasional seronegative patient. Current guidance continues to call for more regional data to refine screening thresholds in resource-limited settings [4,12].

Taken together, these findings reinforce the view that coeliac disease is a common and treatable contributor to iron deficiency anaemia in this population, and that it is readily identified by a simple serological test. Recognising the anaemic patient with unsuspected coeliac disease offers the chance to correct the anaemia at its source rather than through repeated iron replacement alone.

CONCLUSION

Coeliac disease was present in about one in eight adults with iron deficiency anaemia and was associated with significantly lower haemoglobin, although its frequency did not vary with age, gender, or duration of anaemia. These findings support routine serological screening for coeliac disease in adults with iron deficiency anaemia so that affected patients can receive timely gluten-free dietary treatment.

REFERENCES

Lebwohl B, Sanders DS, Green PHR. Coeliac disease. Lancet. 2018;391(10115):70-81. doi:10.1016/S0140-6736(17)31796-8.

Singh P, Arora A, Strand TA, Leffler DA, Catassi C, Green PH, et al. Global prevalence of celiac disease: systematic review and meta-analysis. Clin Gastroenterol Hepatol. 2018;16(6):823-836.e2. doi:10.1016/j.cgh.2017.06.037.

King JA, Jeong J, Underwood FE, Quan J, Panaccione N, Windsor JW, et al. Incidence of celiac disease is increasing over time: a systematic review and meta-analysis. Am J Gastroenterol. 2020;115(4):507-525. doi:10.14309/ajg.0000000000000523.

Rubio-Tapia A, Hill ID, Semrad C, Kelly CP, Greer KB, Limketkai BN, et al. American College of Gastroenterology guidelines update: diagnosis and management of celiac disease. Am J Gastroenterol. 2023;118(1):59-76. doi:10.14309/ajg.0000000000002075.

Husby S, Koletzko S, Korponay-Szabo I, Kurppa K, Mearin ML, Ribes-Koninckx C, et al. European Society Paediatric Gastroenterology, Hepatology and Nutrition guidelines for diagnosing coeliac disease 2020. J Pediatr Gastroenterol Nutr. 2020;70(1):141-156. doi:10.1097/MPG.0000000000002497.

Lopez A, Cacoub P, Macdougall IC, Peyrin-Biroulet L. Iron deficiency anaemia. Lancet. 2016;387(10021):907-916. doi:10.1016/S0140-6736(15)60865-0.

Mahadev S, Laszkowska M, Sundstrom J, Bjorkholm M, Lebwohl B, Green PHR, et al. Prevalence of celiac disease in patients with iron deficiency anemia: a systematic review with meta-analysis. Gastroenterology. 2018;155(2):374-382.e1. doi:10.1053/j.gastro.2018.04.016.

Talarico V, Giancotti L, Mazza GA, Miniero R, Bertini M. Iron deficiency anemia in celiac disease. Nutrients. 2021;13(5):1695. doi:10.3390/nu13051695.

Montoro-Huguet MA, Santolaria-Piedrafita S, Canamares-Orbis P, Garcia-Erce JA. Iron deficiency in celiac disease: prevalence, health impact, and clinical management. Nutrients. 2021;13(10):3437. doi:10.3390/nu13103437.

Ackerman Z, Eliakim R, Stalnikowicz R, Rachmilewitz D. Role of small bowel biopsy in the endoscopic evaluation of adults with iron deficiency anemia. Am J Gastroenterol. 1996;91(10):2099-2102.

Khatoon S, Ahmed A, Yousaf S. Iron deficiency anaemia in Pakistan: celiac disease an underlying cause. J Ayub Med Coll Abbottabad. 2018;30(3):372-376.

Snook J, Bhala N, Beales ILP, Cannings D, Kightley C, Logan RP, et al. British Society of Gastroenterology guidelines for the management of iron deficiency anaemia in adults. Gut. 2021;70(11):2030-2051. doi:10.1136/gutjnl-2021-325210.

Sanders DS, Patel D, Stephenson TJ, Ward AM, McCloskey EV, Hadjivassiliou M, et al. A primary care cross-sectional study of undiagnosed adult coeliac disease. Eur J Gastroenterol Hepatol. 2003;15(4):407-413. doi:10.1097/00042737-200304000-00012.

Emami MH, Karimi S, Kouhestani S. Is routine duodenal biopsy necessary for the detection of celiac disease in patients presenting with iron deficiency anemia? Int J Prev Med. 2012;3(4):273-277.

Zamani F, Mohamadnejad M, Shakeri R, Amiri A, Najafi S, Alimohamadi SM, et al. Gluten sensitive enteropathy in patients with iron deficiency anemia of unknown origin. World J Gastroenterol. 2008;14(48):7381-7385. doi:10.3748/wjg.14.7381.

Javid G, Lone SN, Shoukat A, Khan BA, Yattoo GN, Shah A, et al. Prevalence of celiac disease in adult patients with iron-deficiency anemia of obscure origin in Kashmir (India). Indian J Gastroenterol. 2015;34(4):314-319. doi:10.1007/s12664-015-0586-z.

Masjedizadeh R, Hajiani E, Hashemi J, Shayesteh AA, Moula K, Rajabi T. Celiac disease in South-West of Iran. World J Gastroenterol. 2006;12(27):4416-4419. doi:10.3748/wjg.v12.i27.4416.

Janatolmakan M, Zobeiri M, Rezaeian S, Rostami S, Akbari M, Khatony A. Epidemiology of celiac disease in Western Iran during 2019-2021. Biomed Res Int. 2024;2024:1112812. doi:10.1155/2024/1112812.