

Supplementary Material

Supplementary Table S1: Full details of data extracted from papers

STUDY DETAILS	POPULATION DETAILS	COELIAC DIAGNOSIS	IRON DEFICIENCY DETAILS
Abdalla, A; (2017)(3) Country: USA Study design: Prospective cohort Setting: Community Aim: To estimate prevalence of CD in people with iron deficiency.	Inclusion criteria: 2009-2010 cross-sectional National Health and Nutrition Survey (NHANES). Age groups: 5 years to over 60 years % Children: NR % Female: 100	How was coeliac disease diagnosed: Double +ve for two antibodies % Biopsied: 0 IgA deficiency: Not considered	Definition of iron deficiency: Low ferritin Measure: Lab test Threshold: Ferritin <20ng/ml
Alexander, T.S; (2009)(3) Country: USA Study design: Case control (based on indicator) Setting: Primary Aim: To determine if antigliadin and anti-TTG antibodies are more prevalent in individuals with low hemoglobin levels than in control subjects with normal hemoglobin levels.	Inclusion criteria case: Blood samples submitted to the clinical laboratory (Summa Health System haem lab) for complete blood cell counts. Inclusion criteria controls: Normal haemoglobin levels Age groups: NR % Children: 0 % Female: NR	How was coeliac disease diagnosed: tTG positive % Biopsied: 0 IgA deficiency: Not considered	Definition of iron deficiency: Low haemoglobin levels Measure: Lab test Threshold: </= 10g/dL (low Hb) (>= 13 g/dL (normal Hb))
Ertekin, V; (2005)(3) Country: Turkey Study design: Cohort/cross-sectional Setting: Community Aim: To investigate the prevalence of celiac disease in apparently healthy Turkish schoolchildren and to detect children with silent celiac disease.	Inclusion criteria: Healthy schoolchildren. Age groups: 5 to 17 years % Children: 100 % Female: 26-50	How was coeliac disease diagnosed: tTG positive % Biopsied: 0 IgA deficiency: Tested for	Definition of iron deficiency: NR Measure: Formal diagnosis Threshold: NR

Hujoel, I.A; (2018)(3) Country: USA Study design: Case control (based on coeliac disease) Setting: Primary and secondary Aim: To determine the presence of indications for diagnostic testing and frequency of clinical testing in undiagnosed coeliac disease.	Inclusion criteria case: NR Inclusion criteria controls: No iron deficiency Age groups: 18 to over 60 years % Children: 0 % Female: 51-75	How was coeliac disease diagnosed: Double +ve for two antibodies % Biopsied: 0 IgA deficiency: not considered	Definition of iron deficiency: Iron deficiency Measure: NR Threshold: NR
Javid, G; (2015)(3) Country: India Study design: Case control (based on indicator) Setting: Secondary Aim: To evaluate the prevalence of celiac disease in adult patients with iron-deficiency anemia of obscure origin.	Inclusion criteria case: All consecutive adult patients of IDA with no identifiable cause of bleeding from 2011 to 2014 were included in the study. Inclusion criteria controls: Healthy controls. Age groups: 18 years to over 60. % Children: 0 % Female: NR	How was coeliac disease diagnosed: Serology and only +ve pts biopsied % Biopsied: 50 IgA deficiency: Tested for	Definition of iron deficiency: Low Hb levels, low ferritin levels, low transferrin saturation and a small mean corpuscular volume. Measure: Formal diagnosis Threshold: Hemoglobin level less than lower limits of normal (12.5 g/dL for adult men, 11.0 g/dL for adult women) & Ferritin level <15 ng/mL (normal 20–300 ng/mL) & Transferrin saturation less than 15 % & Mean corpuscular volume less than 80 fL.
Kalayci, A.G; (2005)(3) Country: Turkey Study design: Case control (based on indicator) Setting: Secondary	Inclusion criteria case: Patients diagnosed with iron deficiency anaemia at the Department of Paediatrics and	How was coeliac disease diagnosed: Serology and only +ve pts biopsied	Definition of iron deficiency: Low Hb levels, low MCV, large RBC distribution width, low serum iron,

Aim: To determine the prevalence of coeliac disease in children with iron deficiency anaemia without significant gastrointestinal symptoms.	Paediatric Haematology at the Faculty of Medicine at Ondokuz Mayıs University between July 2000 and September 2001. Inclusion criteria controls: Healthy children visiting the paediatric outpatient clinic for check-up without iron deficiency anaemia. Age groups: 0 to 17 years % Children: 100 % Female: 51-75	% Biopsied: 2 IgA deficiency: Not considered	low transferrin saturation and low ferritin. Measure: Formal diagnosis Threshold: Haemoglobin <10.5 g/dl; mean corpuscular volume (MCV) <75 fl; red blood cell distribution width (RDW) >14.2; serum iron <6.9 mmol/l; transferrin saturation <10.9%; and ferritin <14.7 mg/l.
Lasa, J.S; (2017)(3) Country: Argentina Study design: Case control (based on indicator) Setting: Secondary/community Aim: To determine the prevalence of celiac disease in patients with iron-deficiency anemia.	Inclusion criteria case: From January to December 2015, subjects >18, with a diagnosis of iron-deficiency anemia were enrolled and offered an upper endoscopy. Inclusion criteria controls: Healthy volunteers from the community Age groups: 18 years to over 60 years % Children: 0 % Female: 51-75	How was coeliac disease diagnosed: Serology and all pts biopsied % Biopsied: 100 IgA deficiency: Unclear	Definition of iron deficiency: Low Hb levels and a low ferritin value. Measure: Formal diagnosis Threshold: Hemoglobin value of less than 14 g/dl in men and 12 g/dl in women, with a ferritin value of less than 15ug/l.
Murray, J.A; (2013)(3) Country: USA Study design: Cohort/cross-sectional Setting: Community Aim: To identify the association between CD and iron deficiency.	Inclusion criteria: Males at least 25 years of age and females at least 50 years. Females younger than 50 years were excluded because of the possibility of pre-menopausal iron	How was coeliac disease diagnosed: Double +ve for two antibodies % Biopsied: 0 IgA deficiency: not considered	Definition of iron deficiency: Low serum ferritin concentration Measure: Lab test Threshold: Cases of iron deficiency were defined as having a serum ferritin

	depletion from blood loss. Age groups: 18 years to over 60 years % Children: 0 % Female: 51-75		concentration (SF) $\leq 12 \mu\text{g/L}$.
Narang, M; (2018)(3) Country: India Study design: Case control (based on indicator) Setting: Secondary Aim: To evaluate the proportion of children with moderate to severe iron-deficiency anemia who have associated celiac disease.	Inclusion criteria case: Patients were recruited from the pediatric outpatient department of a tertiary-care center in Delhi over a period of 18 months in 2013-15. Children with visible pallor as detected on physical examination were included in the study if they had moderate-to-severe iron deficiency anaemia. Inclusion criteria controls: Healthy and non-anaemic. Age groups: • 0 to 12 years % Children: 100 % Female: 51-75	How was coeliac disease diagnosed: Serology and only +ve pts biopsied % Biopsied: 7 IgA deficiency: Not considered	Definition of iron deficiency: Low Hb levels. Measure: Formal diagnosis Threshold: Moderate anemia was defined as hemoglobin concentration: 7-9.9 g/dL in children <5 years of age and 8-10.9 g/dL in children of 5 to 12 years of age. Severe anemia was defined as hemoglobin concentration: <7 g/dL in children <5 years of age; <8 g/dL in children of 5 to 12 years of age.
Ransford, R.A.J; (2002)(3) Country: UK Study design: Cohort/cross-sectional Setting: Primary Aim: To evaluate the prevalence of celiac disease in adult patients with iron deficiency anemia compared with a nonanemic control population	Inclusion criteria: Consecutive full blood count (FBC) samples from adult patients sent by local primary care physicians to one haematology laboratory were assessed. Age groups: 13 years to over 60 years old. % Children: 0 % Female: NR	How was coeliac disease diagnosed: Serology and only +ve pts biopsied % Biopsied: 2 IgA deficiency: NR	Definition of iron deficiency: Low haemoglobin levels Measure: Formal diagnosis Threshold: Hemoglobin levels in men, < 11.5 g/dL; in women, < 11g/dL with hypochromic and microcytic indices.
Shahriari, M; (2018)(3) Country: Iran	Inclusion criteria case: During August 2011	How was coeliac disease	Definition of iron deficiency: Low

Study design: Case control (based on indicator) Setting: Secondary Aim: To investigate celiac disease in patients with iron deficiency anemia (IDA).	and February 2013, IDA cases with the maximum age of 18 who were referred to Shiraz University of Medical Science affiliated pediatric hematology clinics (Hb less than normal for their age and ferritin level <20 ng/mL) underwent screening. Inclusion criteria controls: Healthy controls Age groups: 0 to 18 years old % Children: 100 % Female: 26-50	diagnosed: Serology and only +ve pts biopsied % Biopsied: 10 IgA deficiency: Not considered	haemoglobin and low ferritin levels. Measure: Formal diagnosis Threshold: Hb less than normal for their age and ferritin level <20ng/mL.
Ucardag, D.; (2009)(3) Country: Turkey Study design: Case control (based on indicator) Setting: Secondary Aim: To define the prevalence of celiac disease in Turkish patients with iron deficiency anemia of obscure origin.	Inclusion criteria case: NR Inclusion criteria controls: Healthy controls Age groups: 13 years to over 60 years old. % Children: 0 % Female: 51-75	How was coeliac disease diagnosed: Serology and only +ve pts biopsied % Biopsied: 40 IgA deficiency: Not considered	Definition of iron deficiency: Low Hb levels, low ferritin levels, low transferrin saturation and low MCV. Measure: Formal diagnosis Threshold: Haemoglobin level less than lower limits (13.5 g/dl for male adult, 12.0 g/dl for female adult), ferritin level <15 ng/ml (normal 20-300 ng/ml), transferrin saturation less than 15%, and mean corpuscular volume less than 80 fL.
Cikrikcioglu, M.A; (2011)(3) Country: Turkey	Inclusion criteria case: NR	How was coeliac disease	Definition of iron deficiency: NR Measure: NR

Study design: Case control (based on indicator) Setting: Secondary Aim: To investigate the prevalence of CD in patients with restless leg syndrome.	Inclusion criteria controls: - NR - NR Age groups: 18 years to over 60 years old % Children: 0 % Female: 51-75	diagnosed: tTG positive % Biopsied: 0 IgA deficiency: Unclear	Threshold: NR
Abu-Zeid, Y.A; (2014)(3) Country: United Arab Emirates Study design: Cohort/cross-sectional Setting: Community Aim: To determine celiac disease prevalence and associated manifestations or risk factors in healthy adult Emiratis.	Inclusion criteria: Being an adult (16 years of age or more), not previously diagnosed as a CD patient and willing to participate in the study. Age groups: 13 years to 60 years old % Children: 0 % Female: 26-50	How was coeliac disease diagnosed: Double +ve for two antibodies % Biopsied: 0 IgA deficiency: Tested for	Definition of iron deficiency: NR Measure: Self-report Threshold: NR
Sanders, D.S; (2003)(3) Country: UK Study design: Cohort/cross-sectional Setting: Primary Aim: The aim of our study was to establish the prevalence of coeliac disease in the general population and in specific conditions, such as IBS, iron deficiency anaemia and TATT within the primary care setting.	Inclusion criteria: Volunteers, who were aged > 16 years, from five general practices in South Yorkshire, UK. People with known coeliac disease were excluded from the study. Age groups: 13 years to over 60 years old % Children: 0 % Female: 51-75	How was coeliac disease diagnosed: Serology and only +ve pts biopsied % Biopsied: 2 IgA deficiency: Tested for	Definition of iron deficiency: NR Measure: Self-report Threshold: NR
Yap, T.W.C; (2015)(3) Country: Malaysia Study design: Cohort/cross-sectional Setting: Secondary Aim: To determine the seroprevalence of CD antibodies and also investigate the correlation between H.	Inclusion criteria : Cohort study named HEALTH Study (predominately university students). Age groups: 18 to 40 years old % Children: 0 % Female: 51-75	How was coeliac disease diagnosed: Double +ve for two antibodies % Biopsied: 0 IgA deficiency: Not considered	Definition of iron deficiency: NR Measure: Self-report Threshold: NR

pylori infection and CD in the young and healthy multiracial Malaysian population.			
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Supplementary Table 2 S2: Summary table of papers extracted

STUDY DETAILS	POPULATION DETAILS	COELIAC DIAGNOSIS	IRON DEFICIENCY DETAILS
Abdalla, A; (2017)(3) Study design: Prospective cohort Aim: To estimate prevalence of CD in people with iron deficiency.	Age groups: 5 years to over 60 years % Children: NR % Female: 100	How was coeliac disease diagnosed: Double +ve for two antibodies	Definition of iron deficiency: Low ferritin
Alexander, T.S; (2009)(3) Study design: Case control (based on indicator) Aim: To determine if antigliadin and anti-TTG antibodies are more prevalent in individuals with low hemoglobin levels than in control subjects with normal hemoglobin levels.	Age groups: NR % Children: 0 % Female: NR	How was coeliac disease diagnosed: tTG positive	Definition of iron deficiency: Low haemoglobin levels
Ertekin, V; (2005)(3) Study design: Cohort/cross-sectional Aim: To investigate the prevalence of celiac disease in apparently healthy Turkish schoolchildren and to detect children with silent celiac disease.	Age groups: 5 to 17 years % Children: 100 % Female: 26-50	How was coeliac disease diagnosed: tTG positive	Definition of iron deficiency: NR
Hujoel, I.A; (2018)(3)	Age groups: 18 to over 60 years % Children: 0	How was coeliac disease diagnosed:	Definition of iron deficiency: Iron deficiency

Study design: Case control (based on coeliac disease) Aim: To determine the presence of indications for diagnostic testing and frequency of clinical testing in undiagnosed coeliac disease.	% Female: 51-75	Double +ve for two antibodies	Definition of iron deficiency: Anaemia Measure: NR Threshold: NR
Javid, G; (2015)(3) Study design: Case control (based on indicator) Aim: To evaluate the prevalence of celiac disease in adult patients with iron-deficiency anemia of obscure origin.	Age groups: 18 years to over 60. % Children: 0 % Female: NR	How was coeliac disease diagnosed: Serology and only +ve pts biopsied	Definition of iron deficiency: Low Hb levels, low ferritin levels, low transferrin saturation and a small mean corpuscular volume.
Kalayci, A.G; (2005)(3) Study design: Case control (based on indicator) Aim: To determine the prevalence of coeliac disease in children with iron deficiency anaemia without significant gastrointestinal symptoms.	Age groups: 0 to 17 years % Children: 100 % Female: 51-75	How was coeliac disease diagnosed: Serology and only +ve pts biopsied	Definition of iron deficiency: Low Hb levels, low MCV, large RBC distribution width, low serum iron, low transferrin saturation and low ferritin.
Lasa, J.S; (2017)(3) Study design: Case control (based on indicator) Aim: To determine the prevalence of celiac disease in patients with iron-deficiency anemia.	Age groups: 18 years to over 60 years % Children: 0 % Female: 51-75	How was coeliac disease diagnosed: Serology and all pts biopsied	Definition of iron deficiency: Low Hb levels and a low feritin value.

Murray, J.A; (2013)(3) Study design: Cohort/cross-sectional Aim: To identify the association between CD and iron deficiency.	Age groups: 18 years to over 60 years % Children: 0 % Female: 51-75	How was coeliac disease diagnosed: Double +ve for two antibodies	Definition of iron deficiency: Low serum ferritin concentration.
Narang, M; (2018)(3) Study design: Case control (based on indicator) Aim: To evaluate the proportion of children with moderate to severe iron-deficiency anemia who have associated celiac disease.	Age groups: 0 to 12 years % Children: 100 % Female: 51-75	How was coeliac disease diagnosed: Serology and only +ve pts biopsied	Definition of iron deficiency: Low Hb levels
Ransford, R.A.J; (2002)(3) Study design: Cohort/cross-sectional Aim: To evaluate the prevalence of celiac disease in adult patients with iron deficiency anemia compared with a nonanemic control population	Age groups: 13 years to over 60 years old. % Children: 0 % Female: NR	How was coeliac disease diagnosed: Serology and only +ve pts biopsied	Definition of iron deficiency: Low Hb levels
Shahriari, M; (2018) (3) Study design: Case control (based on indicator) Aim: To investigate celiac disease in patients with iron deficiency anemia (IDA).	Age groups: 0 to 18 years old % Children: 100 % Female: 26-50	How was coeliac disease diagnosed: Serology and only +ve pts biopsied	Definition of iron deficiency: Low haemoglobin and low ferritin levels. Measure: Formal diagnosis Threshold: Hb less than normal for their age and ferritin level <20ng/mL.
Ucardag, D.; (2009)(3)	Age groups: 13 years to over 60 years old.	How was coeliac disease diagnosed:	Definition of iron deficiency: Low Hb levels, low ferritin

Study design: Case control (based on indicator) Aim: To define the prevalence of celiac disease in Turkish patients with iron deficiency anemia of obscure origin.	% Children: 0 % Female: 51-75	Serology and only +ve pts biopsied	levels, low transferrin saturation and low MCV.
Cikrikcioglu, M.A; (2011)(3) Study design: Case control (based on indicator) Aim: To investigate the prevalence of CD in patients with restless leg syndrome.	Age groups: 18 years to over 60 years old % Children: 0 % Female: 51-75	How was coeliac disease diagnosed: tTG positive	Definition of iron deficiency: NR
Abu-Zeid, Y.A; (2014)(3) Study design: Cohort/cross-sectional Aim: To determine celiac disease prevalence and associated manifestations or risk factors in healthy adult Emiratis.	Age groups: 13 years to 60 years old % Children: 0 % Female: 26-50	How was coeliac disease diagnosed: Double +ve for two antibodies	Definition of iron deficiency: NR
Sanders, D.S; (2003)(3) Study design: Cohort/cross-sectional Aim: The aim of our study was to establish the prevalence of coeliac disease in the general population and in specific conditions, such as IBS, iron deficiency anaemia and	Age groups: 13 years to over 60 years old % Children: 0 % Female: 51-75	How was coeliac disease diagnosed: Serology and only +ve pts biopsied	Definition of iron deficiency: NR

TATT within the primary care setting.			
Yap, T.W.C; (2015)(3) Study design: Cohort/cross-sectional Aim: To determine the seroprevalence of CD antibodies and also investigate the correlation between H. pylori infection and CD in the young and healthy multiracial Malaysian population.	Age groups: 18 to 40 years old % Children: 0 % Female: 51-75	How was coeliac disease diagnosed: Double +ve for two antibodies	Definition of iron deficiency: NR

Supplementary Material 3: Domains and their respective questions:

Domain 1: Participants/ Patient selection

1. Was a consecutive or random sample of patients enrolled?
2. Was a case-control design avoided?
3. Did the study avoid inappropriate exclusions?

Domain 2: Diagnostic indicator (index test)

4. Modified question: was it the aim of the paper to investigate this diagnostic indicator?

Domain 3: CD diagnosis (reference standard)

5. Is the diagnostic method used likely to correctly CD ?

Domain 4: Patient flow and timing

6. Did all patients receive the same reference standard?
7. Were all patients included in the analysis?

Supplementary Table 3 S3 : Excel table of TP, FN, FP, TN values

RefID	Diagnostic Indicator	TP	FN	FP	TN
43	Iron deficiency	5	2	564	1534
107	Anaemia	5	9	86	1097
433	Anaemia	9	3	77	85
3422	Anaemia	2	0	16	79
5029	Anaemia	4	7	126	1126
7190	Anaemia	24	376	24	376
7190	Iron deficiency	12	388	11	389
7662	Anaemia	13	2	148	158
7896	Anaemia	6	0	129	223

9111	Anaemia	15	2	120	131
11496	Iron deficiency	14	1	557	1141
11656	Anaemia	6	0	146	152
13586	Anaemia	11	1	473	497
14674	Anaemia	3	9	61	1127
15198	Anaemia	0	0	137	47
17038	Anaemia	6	1	71	118
18413	Anaemia	0	6	15	506

Supplementary Table 4 S4: Risk of bias for each domain according to study

Study Details	Patient Selection	Reference Standard	Flow and Timing	Diagnostic indicator
Abdalla, A; (2017)(3)	Low	High	High	Low
Alexander, T.S.; (2009)(3)	High	High	High	High
Ertekin, V.; (2005)(3)	High	High	Low	High
Hujoel, I.A.; (2018)(3)	High	High	High	High
Javid, G.; (2015)(3)	High	Low	High	Low
Kalayci, A.G.; (2005)(3)	High	Low	High	Low
Lasa, J.S.; (2017)(3)	High	Low	Low	Low
Murray, J.A.; (2013)(3)	High	High	High	Low
Narang, M.; (2018)(3)	High	Low	High	Low
Ransford, R.A.J.; (2002)(3)	High	Low	High	Low
Shahriari, M.; (2018)(3)	High	Low	High	Low
Ucardag, D.; (2009)(3)	High	Low	High	Low
Cikrikcioglu, M.A; (2011)(3)	High	High	Unclear	High
Abu-Zeid, Y.A; (2014)(3)	High	High	High	High
Sanders, D.S ; (2003)(3)	High	Low	High	High
Yap, T.W.C; (2015)(3)	Low	High	High	High

Supplementary Table 5 S5: ROC curve- IDA/A statistics table

Parameter	Estimate	2.5%	97.5%
Sensitivity	0.679	0.376	0.882
Specificity	0.757	0.603	0.865
False Positive Rate	0.243	0.135	0.397
logit(sensitivity)	0.751	-0.507	2.009
logit(specificity)	1.139	0.417	1.860

Supplementary Table 6 S6: ROC curve – ID statistics table

Parameter	Estimate	2.5%	97.5%
Sensitivity	0.498	0.050	0.949
Specificity	0.850	0.577	0.959
False Positive Rate	0.150	0.041	0.423
logit(sensitivity)	-0.006	-2.940	2.929
logit(specificity)	1.736	0.311	3.160