

Malabsorption & Celiac Disease

Absorptive Capability of the Small Intestine

- **Length:** Approximately 6 meters.
- **Surface Area:** Enhanced by villi and microvilli, providing a vast area for nutrient absorption. Lybrate

Maldigestion vs. Malabsorption

Aspect	Maldigestion	Malabsorption
Definition	Impaired breakdown of nutrients.	Defective mucosal uptake and transport of adequately digested nutrients, including vitamins and trace elements.
Example	Lactase deficiency leading to lactose intolerance.	Celiac disease affecting the absorption of multiple nutrients.

Malabsorption Syndrome

- **Definition:** A clinical term encompassing defects during the digestion and absorption of food nutrients by the gastrointestinal tract.
- **Types:**
- **Isolated Malabsorption:** Impairment of a single nutrient component (e.g., lactose intolerance).
- **Global Malabsorption:** Diffuse disorders affecting absorption of almost all nutrients (e.g., Celiac disease, Crohn's disease).

Pathophysiology: Phases of Digestion & Absorption

1. **Luminal Phase (Digestion):**
 - **Pancreatic Insufficiency:** Chronic pancreatitis, cystic fibrosis, post-surgical states leading to decreased lipase and protease activity.
 - **Gastric Hypersecretion (Zollinger-Ellison Syndrome):** Inactivation of pancreatic enzymes due to low pH.
 - **Post-Gastrectomy:** Inadequate mixing of nutrients, bile, and pancreatic enzymes.
2. **Mucosal Phase (Absorption):**
 - **Mucosal Damage (Villous Atrophy):**
 - Celiac disease.
 - Intestinal lymphoma.
 - Crohn's disease.
 - Eosinophilic enteritis.
 - Amyloidosis.
 - Small intestinal bacterial overgrowth (SIBO).
 - Giardiasis.
 - Whipple's disease.
 - Tropical sprue.
 - Viral gastroenteritis.
 - Intestinal tuberculosis.
 - NSAIDs, Olmesartan.
3. **Post-Absorptive Phase (Lymphatic Transport):**
 - **Lymphatic Obstruction:**
 - Congenital: Intestinal lymphangiectasia.
 - Acquired: Whipple disease, lymphoma, tuberculosis, congestive heart failure, constrictive pericarditis, radiation therapy, retroperitoneal fibrosis.

Clinical Manifestations of Malabsorption

Symptom/Sign	Mechanism
Weight loss/Malnutrition	Anorexia, malabsorption of nutrients.
Diarrhea	Impaired absorption or secretion of water and electrolytes; colonic fluid secretion secondary to unabsorbed bile acids and fatty acids.
Flatus	Bacterial fermentation of unabsorbed carbohydrates.
Glossitis, Cheilosis	Deficiency of iron, vitamin B12, folate, and vitamin A.
Abdominal Pain	Bowel distention or inflammation, pancreatitis.
Bone Pain	Calcium, vitamin D malabsorption, protein deficiency, osteoporosis.
Tetany, Paresthesia	Calcium and magnesium malabsorption.
Weakness	Anemia, electrolyte depletion (particularly potassium).
Azotemia, Hypotension	Fluid and electrolyte depletion.
Amenorrhea, Decreased Libido	Protein depletion, decreased calories, secondary hypopituitarism.
Anemia	Impaired absorption of iron, folate, vitamin B12.
Bleeding	Vitamin K malabsorption, hypoprothrombinemia.
Night Blindness/Xerophthalmia	Vitamin A malabsorption.
Peripheral Neuropathy	Vitamin B12 and thiamine deficiency.

Diarrhea & Steatorrhea

- **Diarrhea:**
- Most common symptomatic complaint.
- Defined as an increase in stool mass, frequency, or fluidity, typically greater than 200 g per day.
- **Steatorrhea:**
- Result of fat malabsorption.
- Hallmark: Passage of pale, bulky, malodorous stools that float and are difficult to flush.
- Presence of floating oil droplets in the toilet.

Weight Loss & Fatigue

- **Weight Loss:**
- Common and may be pronounced.
- Patients may compensate by increasing caloric consumption, masking weight loss.
- More likely in diffuse diseases like celiac disease and Whipple disease.
- **Fatigue:**
- Often due to anemia and nutrient deficiencies. [Medscape](#)

Flatulence & Abdominal Distention

- Caused by bacterial fermentation of unabsorbed food substances, releasing gases like hydrogen and methane.
- Leads to uncomfortable abdominal distention and cramps.

Edema

- Hypoalbuminemia from chronic protein malabsorption or loss into the intestinal lumen causes peripheral edema.
- Extensive lymphatic obstruction (e.g., intestinal lymphangiectasia) can cause protein loss.
- Severe protein depletion may lead to ascites.

Anemia

- **Types:**
- **Microcytic:** Iron deficiency, often seen in celiac disease.
- **Macrocytic:** Vitamin B12 deficiency, common in ileal involvement or resection (e.g., Crohn's disease).

Metabolic Bone Disease

- Vitamin D deficiency can cause osteopenia or osteomalacia.
- Bone pain and pathologic fractures may be observed.
- Calcium malabsorption can lead to secondary hyperparathyroidism.

Carbohydrate Malabsorption

- **Etiology:**
 - Lactase deficiency (most common).
 - Post-intestinal resection.
 - Mucosal diseases.
 - Post-infectious gastroenteritis.
 - Dietary changes (e.g., Eastern to Western diet).
 - **Workup:**
 - **Stool Osmolality:** Normally equals plasma osmolality (~290 mOsm/kg).
 - **Stool Osmotic Gap:** 100 mOsm/kg indicates osmotic diarrhea.
 - **Stool pH:** <6 suggests fermentation.
 - **Lactase DNA Assay:** Genetic testing for lactase deficiency.
 - **Hydrogen Breath Test:** Increased hydrogen indicates carbohydrate malabsorption.
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Celiac Disease (Continued)

Epidemiology

- Primarily affects **whites of northern European ancestry**.
- **Prevalence in at-risk groups:**
- 1 in 22 → first-degree relatives
- 1 in 39 → second-degree relatives
- 1 in 56 → symptomatic patients
- 1 in 300–500 → general population

Pathogenesis

- **Genetic factors:**
- Strong **intrafamilial occurrence**
- HLA-DQ2 and/or DQ8 genes (in ~36%)
- Associated with **chromosome 15q26** (linked to T1DM)
- Non-HLA loci → inherited as **autosomal recessive**

🌱 Classifications

Type	Description
Classic	Villous atrophy + malabsorption symptoms + improvement on gluten-free diet
Latent	Recovered as child with gluten-free diet, remained silent, then developed CD again later
Potential	Positive serology/genetics but normal biopsy ; risk of developing CD later

🔗 Association with Type 1 Diabetes

- Approximately 5% of patients with type 1 diabetes develop celiac disease.
- Common initial findings include:
- Unpredictable blood glucose levels.
- Recurrent hypoglycemia.
- Poor glycemic control.
- Growth failure due to erratic nutrient absorption.

🏠 Classic Celiac Disease – Features

- **Three key components:**
- 1. **Villous atrophy**
- 2. Symptoms of **malabsorption** (steatorrhea, weight loss, vitamin deficiency)
- 3. **Resolution** on gluten-free diet

😴 Latent Celiac Disease

- Diagnosed in **childhood**, recovered with gluten-free diet
- Remained silent even on gluten-containing diet
- CD can develop **again later** despite past normal biopsy

⚠️ Potential Celiac Disease

- Normal biopsy
- **Positive serology or genetics**
- No treatment unless disease manifests
- Risk of developing CD in future → **monitor only**
- 🧠 **Important:** Biopsy from **distal duodenum (D2)** is most involved site!

🌱 Clinical Manifestations of Celiac Disease

🏠 GI and Nutritional:

- Diarrhea with **bulky, foul-smelling, floating stools**
- Steatorrhea, flatulence, bloating
- **Weight loss**
- **Growth retardation** (children)
- Iron deficiency anemia
- Osteopenia, osteomalacia (Vit D/Ca def.)

🧠 Neurological:

- Fatigue, mood changes
- Ataxia, headache, epilepsy
- Depression, anxiety, idiopathic ataxia
- Peripheral neuropathy (Vit B12/Thiamine def.)

🦴 Musculoskeletal:

- Arthritis (41% on gluten diet, 22% gluten-free)
- Bone pain, pathological fractures

🩸 Hematologic:

- Iron def anemia (esp. in CD)
- Macrocytic anemia (B12)

🧬 Subclinical:

- Fatigue, mood changes
- Borderline iron deficiency
- Elevated liver enzymes (aminotransferases)

👤 Associated Conditions

Condition	Notes
Dermatitis herpetiformis (DH)	Itchy papulovesicles; granular IgA deposits. Seen in 24% of CD, 85% of DH have CD.
T1DM	2.6–7.8% of T1DM patients have CD
Selective IgA Deficiency	2–3% → can cause false-negative serology

Down, Turner, Williams syndromes	High association rates (4–19%)
Autoimmune thyroiditis, liver disease, cardiomyopathy	Common in CD

🧠 Celiac Disease increases risk for **Enteropathy-associated T-cell lymphoma (EATL)**

🟢 Who Should Be Screened for CD?

📌 GI Symptoms:

- Chronic diarrhea
- Weight loss, malabsorption
- Abdominal distention

➡ Non-GI Symptoms/Findings:

- Short stature, delayed puberty
- Iron deficiency anemia
- Elevated aminotransferases
- Recurrent miscarriage or infertility

🧬 High-Risk Groups:

- T1DM
- Autoimmune endocrinopathies
- First/second-degree relatives of CD patients
- Down, Turner, Williams syndromes
- Refractory anemia, IBS-like symptoms, ataxia

🟢 Serologic Testing – Accuracy Table

Antibody	Sensitivity	Specificity
IgA anti-tTG (transglutaminase)	90–98%	95–97%
IgA EMA (endomysial Ab)	85–98%	97–100%
IgA anti-gliadin Ab	80–90%	85–95%
IgG anti-gliadin Ab	75–85%	75–90%

⚠️ In IgA deficiency, use IgG-based tests

🔬 Small Bowel Biopsy – Diagnosis

Feature	Description
Mucosal inflammation	Lymphocytic infiltration
Villous atrophy	Flattened absorptive surface
Crypt hyperplasia	Elongated regenerative crypts
Repeat biopsy	After 3–6 months on gluten-free diet

🧠 Biopsy = gold standard for diagnosis

🧠 Management of Celiac Disease

🌱 Core Principles:







- 🧑🍳 Consult a dietitian
- 📖 Patient education
- ❌ Lifelong gluten-free diet
- 🥄 Correct nutritional deficiencies (Fe, B12, Ca, Vit D)
- 🧑🏆 Access support groups
- 📅 Regular follow-up with a multidisciplinary team






🍌 Gluten-Free Diet – What to Avoid?

❌ Gluten Sources
Wheat
Barley
Rye














✅ Allow: corn, rice, potato, quinoa, oats (if uncontaminated)

CELIAC WHEAT – Disease Core










- C –  **Crypt hyperplasia** (biopsy finding)
- E –  **EMA / anti-TTG antibodies** (best serologic tests)
- L –  **Lymphocytic infiltration** (immune cells in biopsy)
- I –  **Iron deficiency anemia** (microcytic type)
- A –  **Atrophy of villi** (flattened lining = hallmark)
- C –  **Classic triad**: Steatorrhea, Weight loss, Diet response

- W –  **Wheat** (major gluten source)
 - H –  **HLA-DQ2/DQ8** (genetic risk)
 - E –  **Enteropathy** (chronic gut inflammation)
 - A –  **Autoimmune links** (like T1DM, thyroiditis)
 - T –  **T-cell lymphoma** (EATL risk, serious stuff!)
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BAD GAS From CELIAC – Symptoms

- B –  **Bloating**
 - A –  **Anemia**
 - D –  **Diarrhea**
 - G –  **Growth retardation** (especially in kids)
 - A –  **Arthritis**
 - S –  **Steatorrhea** (floating, greasy poop)
 - F –  **Fatigue**
 - C –  **Cheilitis/Glossitis** (cracked lips, smooth tongue)
 - E –  **Electrolyte abnormalities** (Ca, Mg, K issues)
 - L –  **Liver enzymes elevated**
 - I –  **Infertility**
 - A –  **Ataxia** (balance problems)
 - C –  **Constipation sometimes** (yep, not always diarrhea)
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CANCER BAD – Complications

- C –  **Carcinoma of the small bowel**
 - A –  **Anemia** (chronic)
 - N –  **Neuropathy** (B12-related)
 - C –  **Crypt hyperplasia persists** (active disease)
 - E –  **EATL – T-cell lymphoma**
 - R –  **Refractory CD** (won't respond to diet)
 - B –  **Bone fractures** (osteopenia/osteomalacia)
 - A –  **Amenorrhea**
 - D –  **Dermatitis herpetiformis** (itchy rash)
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TEG – Serologic Tests


T –  Tissue transglutaminase (anti-TTG)

E –  Endomysial antibody (EMA)


G –  Gliadin antibody (IgA or IgG)


⚠ If IgA deficient → use IgG-based tests instead!


G-FREE – Management

G – ✕  Gluten-free diet (forever and ever!)


F –  Fix deficiencies (iron, B12, D, Ca)

R –  Regular follow-up (labs, bone health, weight)

E –  Educate patient/family (label reading champs!)


E –  Evaluate for complications (lymphoma, fractures, etc.)

✓ ABC – Classic Biopsy Findings in Celiac Disease

 When a small bowel biopsy is done (usually from the **second part of the duodenum – D2**), these are the classic histological findings:

Letter	Meaning	Explanation
A	Atrophy of villi	Flattened or absent villi = reduced surface area for absorption
B	Blunted mucosa	Mucosal surface looks smooth and distorted
C	Crypt hyperplasia	Glandular structures (crypts) are elongated and increased in number due to mucosal regeneration efforts

Bonus Tip for Exams:

If you see **villous atrophy + crypt hyperplasia + increased intraepithelial lymphocytes**, think **CELIAC** 
Biopsy is still the **gold standard** for diagnosis (especially when combined with positive serology).