Lactose Intolerance – A Review

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Lactose intolerance is a clinical condition characterized by the inadequate hydrolysis of lactose due to a deficiency in the lactase enzyme, which is essential for its digestion in the small intestine. This enzymatic insufficiency impairs the breakdown of lactose into glucose and galactose, resulting in gastrointestinal symptoms such as abdominal pain, bloating, and diarrhea following the ingestion of lactose-containing foods. The condition can arise from primary genetic factors or secondary causes and exhibits variability in symptom severity among individuals. Lactose intolerance is also known as lactose malabsorption.[1]

The symptoms of lactose intolerance are caused by:[2]

1. Lactase Deficiency: Insufficient lactase enzyme prevents proper breakdown of lactose in the small intestine.
2. Lactose in the Colon: Undigested lactose reaches the colon.
3. Bacterial Fermentation: Bacteria in the colon ferment the lactose, producing gases and increasing liquid in the colon.
4. Gas and Liquid Production: This results in bloating, flatulence, and diarrhea.
5. Lactase Variability: Some people have a fast-moving colon, reducing symptom severity.
6. Intestinal Flora: The types and amounts of bacteria in the colon affect symptoms.
7. Food and Drink: High-fat foods can slow digestion, giving the small intestine more time to produce lactase and potentially reducing symptoms.

Pathophysiology of lactose intolerance

Lactose intolerance is a clinical syndrome marked by the appearance of characteristic signs and symptoms after consuming foods that contain lactose, a type of disaccharide. A deficiency in lactase leads to unabsorbed lactose in the bowel, causing osmotic diarrhea due to fluid influx. Colonic bacteria then ferment the lactose, producing gases (hydrogen, carbon dioxide, and methane) and further increasing fluid in the bowel. This combination results in abdominal symptoms. Certain genetic variants, such as the rs4982235 SNP, are associated with lactose intolerance in specific populations.[1]

Diagnosis of lactose intolerance:[3]

- Hydrogen Breath Test (H2 Breath Test): Measures hydrogen (H2) in exhaled air. Bacteria in the bowel ferment lactose, producing hydrogen. An increase of more than 20 ppm in breath hydrogen after ingesting 50 grams of lactose is diagnostic.
- Lactose Tolerance Test (LTT): Assesses the rise in blood glucose levels. An abnormal result is indicated by a failure of blood glucose to increase within 30 minutes after consuming a 50-gram lactose load.
- Stool Acidity Test: Measures stool pH. The fermentation of undigested lactose produces lactic acid and other acids detectable in a stool sample.
- New Tests: Genetic testing of blood or saliva to identify lactose intolerance.

Management of lactose intolerance

The management of lactose intolerance includes:[1]

1. Avoiding Lactose: Eliminate or reduce lactose-containing foods and use lactose-free alternatives.
2. Lactase Supplements: Use over-the-counter lactase enzyme supplements.
3. Gradual Reintroduction: Slowly reintroduce small amounts of lactose to test tolerance.
4. Nutritional Management: Ensure adequate calcium and vitamin D intake from non-dairy sources or supplements.
5. Education: Inform patients about dietary adjustments and seek professional guidance for personalized advice.

Vitamin B12 supplements are a good alternative for those avoiding dairy, as dairy is a key B12 source, and lactose-free milk may lack sufficient B12 if not fortified.

Lactose-free milk offers essential nutrients like calcium, vitamin D, and B12, making it ideal for lactose-intolerant individuals when fortified.

Reducing regular milk intake to under 12 grams of lactose per meal can help manage lactose intolerance while still providing key nutrients.[4]

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Oral Lactase Supplementation Significantly Reduces Clinical Symptoms and Hydrogen Breath Excretion in Lactose-Intolerant Patients

Due to mucosal injury or genetic factors, lactase deficiency leads to undigested lactose reaching the colon where it ferments, causing lactose intolerance. This condition is diagnosed through clinical symptoms (bloating, abdominal pain, flatulence), lactose hydrogen breath test (HBT), and lactose tolerance test. No Indian studies have explored lactase supplements.

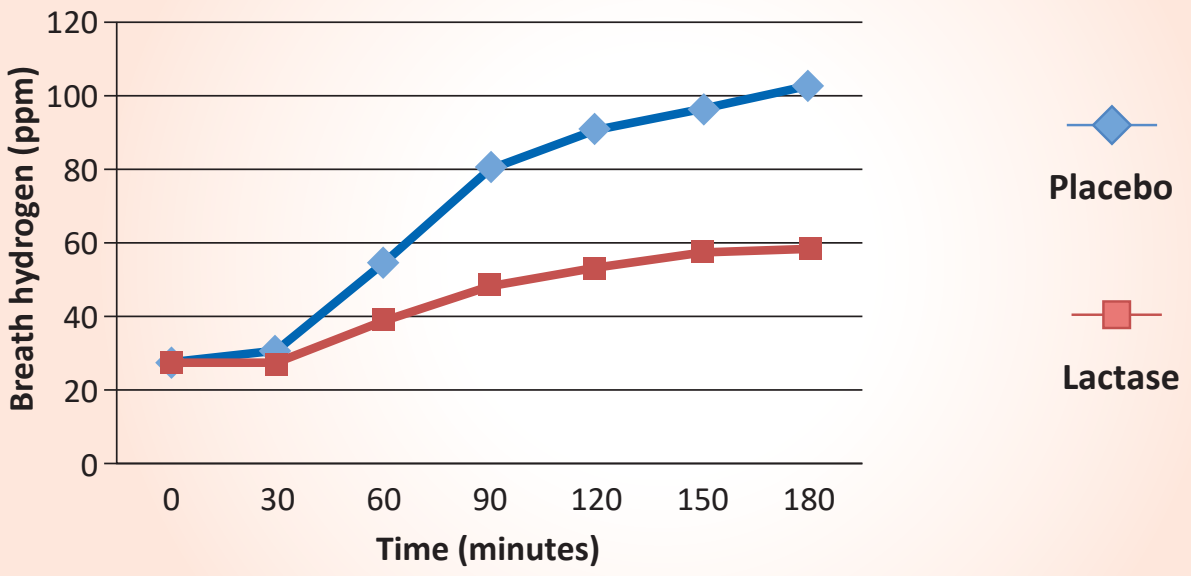
Objective: To evaluate the effect of lactase chewable tablets on clinical symptoms and hydrogen breath excretion in lactose-intolerant patients.

Methods

- **Study Design:** Randomized, double-blind, crossover, placebo-controlled trial.
- **Participants:** 47 adults (mean age 33.6 years; 30 males) with lactose intolerance confirmed by Lactose Hydrogen Breath Test (HBT).
- **Intervention:** Administration of lactase chewable tablets and placebo in a crossover design with a 1-week washout period between treatments.

Each participant was given 25 grams of lactose to induce symptoms. During this phase, clinical symptoms were recorded using a visual analog scale, and hydrogen breath levels were measured every 30 minutes for 180 minutes. After a 1-week washout period, participants switched treatments in a crossover design, with the same measurements recorded. The effectiveness of lactase was assessed by comparing changes in symptom severity and hydrogen breath levels between the lactase and placebo phases.

Fig. 1: Hydrogen Breath Levels Compared Between Lactase and Placebo Groups Following Crossover (n = 47)



- Improvement in clinical symptoms and mean clinical scores with lactase ($P < 0.05$).
- Significant reduction in mean hydrogen breath levels with lactase ($P < 0.05$).
- 55% reduction in cumulative hydrogen breath levels with lactase compared to placebo.

Conclusion

Oral lactase supplementation significantly reduced clinical symptoms and hydrogen breath excretion in patients with lactose intolerance.

Reference:

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