

Malabsorptive Disorders of the Gastro-Intestinal Tract

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ABSTRACT

Malabsorptive disorders of the gastrointestinal tract are common in the industrialised countries and especially among the Caucasians. Little or no report of this condition exists in many African countries. Reports from Nigeria are mainly in the paediatric age with little among the adults.

Over the years, literature on clinical decisions, reports, investigative modalities and their results have been critically reviewed and have shown a lack of comprehensive management plan adaptable to our environment. To prevent morbidity and mortality it is thus imperative to identify patients with malabsorptive disorders of the gastro-intestinal tract on time and involve experienced gastroenterologists in the management.

INTRODUCTION

Mal-digestion actually refers to impaired hydrolysis of luminal content while Mal-absorption refers to impaired transport across the mucosa. In clinical practice, mal-absorption is used to describe the end result of either effect^{1,2,3}.

Mal-absorption may involve a broad range of nutrients called pan-malabsorption or only an individual nutrient or class of nutrients - specific mal-absorption¹. The causes of malabsorption can be sorted into 3 classes:

- Impaired luminal hydrolysis
- Impaired mucosal function (mucosal hydrolysis, uptake and packaging)
- Impaired removal of nutrients from the mucosa.

CLINICAL PRESENTATION

The clinical presentation varies widely, depending on the type of malabsorption^{1,4} They include:

- Steatorrhea - foul smelling greasy stool with increased fat with tendency to float because of incorporated gas.

- Chronic watery diarrhea from unabsorbed carbohydrates and short chain fatty acids.
- Signs of vitamin and mineral deficiencies- anaemia (not a constant finding), easy bruising, tetany and osteoporosis^{1,4,5}, glossitis, cheilosis and to a lesser extent beriberi, pellagra, and scurvy.
- Distended abdomen- due to fermentation of unabsorbed carbohydrates,^{1,5} there is increased flatus(which may be the only finding in some specific malabsorptive problems e.g. lactase deficiency.)¹
- Weight loss is common in pan-malabsorption⁴, though it usually levels off.
- Oedema of the legs may occur late in the disease especially when there is co-existing protein losing enteropathy.
- Constitutional symptoms-chronic fatigue, weakness, amenorrhea, infertility, and impotence.
- Abdominal pain may occur though it is rare except in chronic pancreatitis, Zollinger Ellison Syndrome, lymphoma, and Ischemia of the GIT.

There may be signs and symptoms relating to Bechets syndrome, Whipples disease, Dermatitis herpertiformis, Celiac disease, scleroderma and cystic fibrosis when any of these is the cause.

Several systemic diseases can manifest as the cause as in endocrine diseases, collagen vascular diseases, amyloidosis or infections such as HIV/AIDS¹.

DIAGNOSIS

Patients with established pan-malabsorption typically have several laboratory abnormalities; unlike patients with isolated mal-absorption.^{1,2,4}

- Complete blood count – may show microcytic or macrocytic anaemia, WBC count and platelet are usually normal^{1,5}. Lymphopenia may be present in AIDS, or lymphangiectasia. Thrombocytaemia is usually due to iron deficiency.
- Biochemical screening usually show abnormalities of Hypokalemia, hypochloraeaemia, and acid-base abnormalities which are usually due to a combination of poor intake and excessive loss in the stool^{1,3}.

- C. Renal function test – is usually normal
- D. Liver function –is usually normal. Total protein and albumin are usually normal except in protein losing enteropathy or when a concurrent illness is present¹.
- E. Prothrombin time and PTTK are usually normal except in cases due to prolonged poor intake, chronic Steatorrhea, antibiotic therapy, or colectomy¹.
- F. Blood levels of potentially mal-absorbed substances like serum iron, Vit B12, folate, 25 hydroxy-Vitamin D, and carotene are not very sensitive and specific^{1,2,3,4}.

G. Tests of fat absorption

A comprehensive test of fat excretion estimation over 48hrs to 72hrs is the gold standard in evaluation of panmalabsorption^{6, 1,2,3,7} and attempts to replace it with modern tests like the 14C triolein Breath test have not been successful. In two separate works by Lust et al and Einarsson et al both affirm the usefulness of this test.^{8,9}

Patient must be on a normal diet of 100 grams per day of fat. Stool is collected for 72 hours and analysed for fat excretion. Pancreatic exocrine insufficiency is associated with fat excretion concentration more than 10g/100gm stool. The result of the test can be affected by intake of mineral oil and other poorly absorbed lipids like olestra.

- H. **Test of protein absorption:** does not add much to the assessment of the patients, but may be necessary in protein losing enteropathy α 1-antitrypsin clearance^{1,4}.

I. Test of carbohydrate absorption include:

- **Oral tolerance test**, with a test sugar (glucose, sucrose or lactose). Sugar is administered and blood levels are measured over time, if there is no rise, malabsorption is implied e.g. 25grams D-Xylose is given orally, blood levels are measured at 1hr and 3hr, urinary level is also measured over 5hrs. Blood levels less than 20mg/100mls at 1hr and 22.5mg/100ml at 3hr or urinary output less than 5g/5hr suggests the diagnosis. False positive and negative results exist.¹⁰
- **Hydrogen breath test;** is another test of carbohydrate malabsorption very useful test for assessing intestinal absorptive functions especially disaccharides deficiency.¹¹

Lactose or sucrose substrate is ingested orally, if unabsorbed it passes into the colon, it is fermented by colonic bacteria producing hydrogen as a by product. The hydrogen is transported through the circulation to the lungs and expelled. This can be measured by gas chromatography. Levels more than 10-20ppm suggest mal-absorption. False positive and negative results also occur.¹⁰

- J. **Test of ileal function**, Schilling's test: –Part II of this test is done as the first step. Radiolabelled B₁₂ and exogenous intrinsic factor are given simultaneously by mouth. Unlabelled B₁₂ is given by injection to saturate internal B₁₂ binding sites and 24hours urinary recovery of the Radiolabelled is measured. Recovery of less than 9% of the administered dose suggests ileal dysfunction. Again false positive results exist.^{1,2,3}

- K. **Evaluation of bile-acid mal-absorption;** especially in cases of chronic watery diarrhea to exclude selective bile-acid mal-absorption.

- **SHECAT:** (Selenium – 75-labelled taurohomocholic acid) test. Radioactive taurocholic acid analog is administered orally, and total body retention is measured over several days by repeated Gamma scintigraphy. Retention of less than 50% after 8 days suggests bile-acid mal-absorption.^{1,2}
- The 14C glycocholic acid test can similarly be used for same purpose.

L. Test of small bowel bacterial overgrowth

The 14C glycocholic acid test can be used, here a 14C labeled glycine residue of bile acid is liberated when bile acid is deconjugated and glycine is metabolized by bacteria. Radio-active C₀₂ is expired and measured. This indirect test is easy to perform, readily accepted by patients but has a lot of diagnostic doubts.^{12,13}

Others tests depend on unabsorbed substrates liberating CO₂ e.g. 14C xylose, glucose-breath hydrogen test. The gold standard of demonstrating small bowel bacterial overgrowth is the quantitative culture of jejunal aspirate obtained through a tube or long endoscope under radio-graphic or direct visual guidance. This test is difficult to perform and is not readily included in the daily routine of specialized laboratories.¹⁴

M. Tests of exocrine pancreatic insufficiency.

It is necessary, whenever Steatorrhea is present due usually to pancreatic diseases. The tests are:

- Stool chymotrypsin: a low concentration is suggestive.
- Bentiromide test
- The gold standard of pancreatic exocrine function is duodenal intubation and stimulation of the pancreas with secretin, secretin and CCK or a test meal (Lundh meal). Enzymes and bicarbonate can be measured. Steatorrhea usually does not occur until less than 10-20% pancreatic secretory capacity remains.^{1,2,15,}

N. Imaging

- Visualization of the absorptive surface of the small intestine by means of a small bowel follow through study or by enteroclysis can define the cause of malabsorption. Various details are associated with some conditions. However, techniques and radiographic techniques make the details differ and no radiologist can conclusively diagnose malabsorption based on these details, they can only suggest. Sometimes severe malabsorption may be present without radiographic appearance. Radiography therefore cannot be used as a substitute for functional testing.^{1,2}
- CT Scan – can visualize the pancreas, lymph nodes and mesentery. This often permits additional conditions to be considered.^{1,2}
- Upper GIT Endoscopy: Gross mucosal changes can be visualized by upper GIT endoscopy or enteroscopy and biopsy and jejunal content can be obtained. However it is not worthwhile doing endoscopy examination for the purpose of inspecting the mucosa¹.

O. Pathology

Most patients with pan-malabsorption will require a small bowel biopsy to identify or exclude mucosal disease¹.

Differential diagnosis and specific entities causing malabsorption

The differential diagnoses are quite broad but for clinical purposes it is useful to divide these into the categories below:

Mal absorption in the tropics

Common causes of malabsorption in the tropics differ from those in the industrialised world¹⁶. These causes also affect travelers to the tropics. Infectious causes remain the most common with Giardiasis being the most implicated¹⁶.

Chronic diarrheas in the immunocompromised patients from organisms like Microsporidia, *E. bienusi*, *E. intestinalis*, etc. Heavy infection with *Strongyloides stercoralis* including the hyper-infection syndrome¹⁶. Other parasitic infections like Hookworm, Ascariasis, Coccidiasis, and with *P. falciparum*.^{17,18,19,20} Celiac disease is rare, but may be seen in expatriates visiting the tropic.^{21,22,23} Lymphoma especially Immunoproliferative small intestinal disease (IPSID) and primary upper small intestinal lymphoma (PUSIL) are found in low socio-economic conditions,¹⁶ like Nigeria.²⁴ Severe malnutrition as in PEM can cause malabsorption. Primary hypolactasia is rare in Africans as most adults avoid milk¹⁶. Tropical enteropathy from increased load of commensals and pathogenic micro-organisms causing mucosal abnormalities. Tropical sprue is not common in Africans but has been reported^{16,25,26}.

Malabsorption in childhood and infancy

This should bring to mind distinct congenital defect like cystic fibrosis, or celiac disease. Growth retardation is more prominent than weight loss¹.

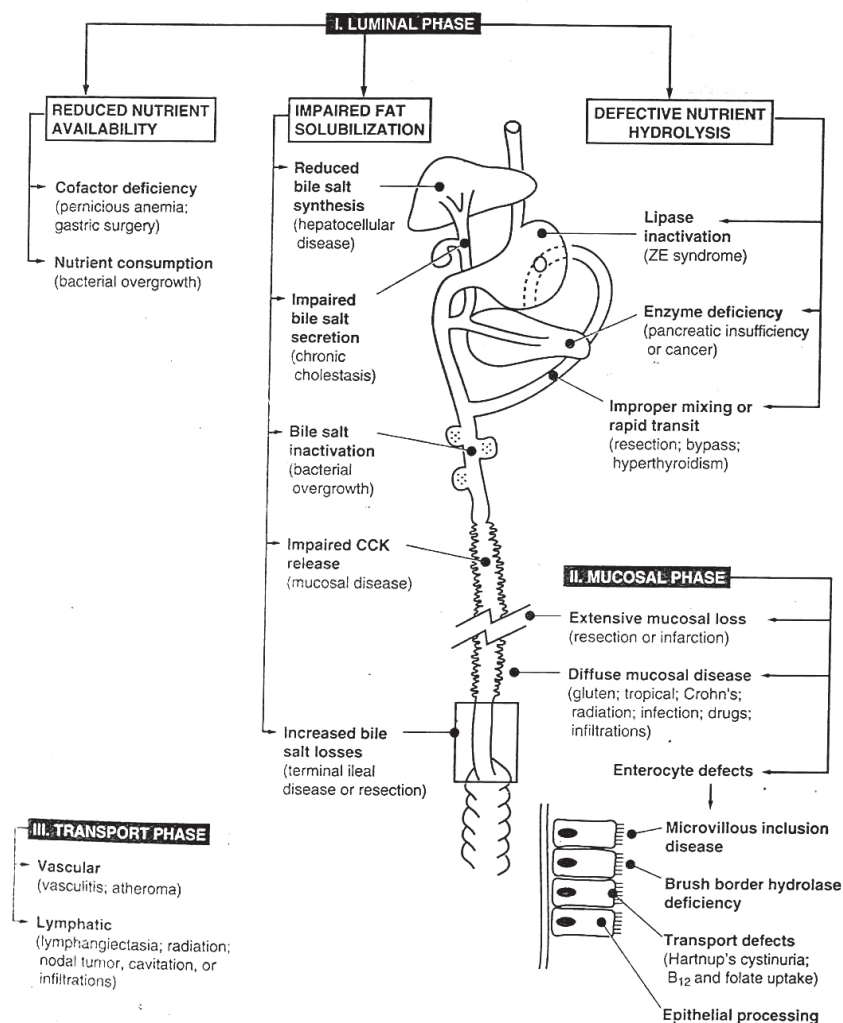
Malabsorption in the elderly

Almost any cause of mal-absorption can be a cause, but small bowel bacterial overgrowth due to hypochlorhydria, motility disorders, jejunal diverticula, pancreatic exocrine insufficiency and Diabetes mellitus¹ are more common.

PRINCIPLES OF TREATMENT

- Correction of nutritional deficiency
- Treatment of the underlying disorder if this is feasible.

Some specific causes respond well to treatment e.g. Celiac disease responds to gluten free diet. In Tropical Sprue there is need to restore water, electrolyte and nutritional deficiencies. Vitamin B₁₂ may be given parenterally to restore depleted stores. Broad spectrum antibiotics such as tetracycline in a dose of 250mg 6hourly for 28 days along with folic acid 5mg daily improves jejunal morphology. In small bowel bacterial overgrowth, tetracyclines 250mg 6hourly for 7days eradicates the bacterial load. Alternatives are metronidazole (400mg tid) or ciprofloxacin (250mg bid).



Intramuscular Vit B₁₂ is needed in chronic cases. Whipple's disease responds to any of these antibiotics, penicillin, tetracycline or sulphonamide.

Symptoms resolve within one week.

CONCLUSION

Malabsorption remains an important cause of gastrointestinal problems all over the world. Identifying the specific cause is paramount in the management. In our environment where there are limited facilities for investigations, involving an experienced gastroenterologist is much more likely to improve the outcome.

REFERENCES

- Schiller LR. Malabsorption disorders in: Friedmin SL, Mcpuid RK and Grendell JU(Eds). Current diagnosis and treatment in gastroenterology 2nd edition McGraw-Hill/Appleton and Lange 2002.
- Riley SA and Marsh MN. Maldigestion and Malabsorption in: Feldman M, Scharschmidt BF, Sleisenger MH, Fordtrans JS, Zorab R and Saunders WB. Sleisenger and Fordtrans gastrointestinal and liver diseases: pathophysiology/ diagnosis/management 6th edt 1998.
- Semrad CE and Chang EB. Malabsorptive syndrome in: Goldman Cecil textbook of Medicine 21st edt Saunders WB company 2000.
- Ahnen DJ. Disorders of digestion and absorption In: Humes DH, Dupont HL (Eds) Kellys Textbook of Internal Medicine Lippincott Williams & Wilkins publishers 2000.
- Losowsky MS, Investigation and differential diagnosis of malabsorption in: Ledingham JGG and Warell DA (Eds) Concise textbook of Medicine Oxford press 2000
- Harewood GC, Murray JA. Approaching the patient with chronic malabsorption syndrome. *Semin Gastrointest Dis* 1999; 10(4): 138-144.
- Butler RN, Gehling NJ, Lawson MJ, Grant AK. Clinical evaluation of the 14C Triolein breath test: a critical analysis *Aust N Z J Med*1984; 14(2): 111-113.
- Einarsson K, Bjorkhem I, Eklof R, Blomstrand R. 14C triolein breath test as a rapid and convenient screening test for fat malabsorption. *Scand J Gastroenterol* 1983; 8(1): 9-12.
- Lust M, Nandurkar S, Gibson PR. Measurement of faecal fat excretion: an evaluation of attitudes and practices of Australian gastroenterologists. *Intern Med J* 2006; 36(2): 77-85.
- Keller J, Layer P. Intestinal function tests. *Schweiz Rundsch Med* 2005; 94(37): 1433-1438.
- Casellas F, Chicharro C, Malagelada JR. Potential usefulness of hydrogen breath test with D-Xylose in clinical management of intestinal malabsorption. *Dig Dis Sci* 1993; 38(2): 321-327.

27. Bayeli PF, Mariottin M, Lisi L, Ferrari P, Tedone F. Guidelines on intestinal dysmicrobism (SIBO Small Intestinal Bacterial Overgrowth) *Minerva Gastroenterol Dietol* 1999; 45(4): 297-308.
 28. Quera PR, Quigley EM, Madrid SAM. Small intestinal bacterial overgrowth. An update *Rev Med Chil* 2005; 13(2); 321-327.
 29. Schiller LR. Evaluation of small bowel bacterial overgrowth *Curr Gastroenterol Rep* 2007; 9(5): 373-377.
 30. Feurle GE, Morgenstern W, Pfaff H. Diagnosis of exocrine pancreatic insufficiency from stool fat and weight. *Klin Wochenschr* 1983; 61(4): 199-202.
 31. Farthing MJG. Malabsorption in the tropics in: Ledingham JGG and Warell DA (EDS) Concise Oxford textbook of Medicine Oxford press 2000.
 32. Brasitus TA. Parasites and malabsorption. *Am J Med* 1979; 67(6): 1058-1065.
 33. Brasitus TA. Parasites and malabsorption. *Clin Gastroenterol* 1983; 12(2): 495-510.
 34. Mahalanabis D, Simpson TW, Chakraborty ML, Ganqli C, Bhattacharjee AK, Mukherjee KL. Malabsorption of water miscible Vitamin A in children with Giardiasis and Ascariasis, *Am J Clin Nutr* 1979; 32(2): 313-318.
 35. Tripathy K, Dugue E, Bolanos O, Lotero H, Moyoral LG. Malabsorption syndrome in Ascariasis. *Am J Nutr* 1972; 25(11): 1275-1281.
 36. Cataldo F, Montaldo G. Celiac disease in the developing countries: a new and challenging public health problem. *World J Gastroenterol* 2007; 13(15): 2153-2159.
 37. Ben Hariz M, Kallel-Sallami M, Kallel L, Lahmer A, Halioui S, Bouraoui S et al Prevalence of Celiac disease in Tunisia: mass screening study in school children. *Eur J Gastroenterol Hepatol* 2007; 19(8): 687-694.
 38. Mankai A, Lanolsi H, Chahed A, Gaeddah L, Limen M, Ben Abdessalam M et al. Celiac disease in Tunisia; serological screening in healthy blood donors. *Pathol Biol* 2006; 54(1): 10-13.
 39. Peetermans WE, Vonck A. Tropical sprue after travel to Tanzania. *J Travel Med* 2000; 7(1): 33-34.
 40. Prendki V, Grandiere-perez L, Ansart S, Fenollar F, Bricaire F, Caumes E. Tropical sprue in two foreign residents with evidence of Tropheryma whipplei in one case. *J Travel Med* 2006; 13(3): 175-177.
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