Mini Review

Microbiological Role of Malabsorption: A New Medical Hypothesis

Ahed J Khatib[1,2*], Marwa Yousry A. Mohamed[3]

[1]Department of Legal Medicine, Toxicology and Forensic Medicine, Jordan University of Science and Technology, Irbid, Jordan, [2]Department of Medicine and Critical Care, Academician Secretary of Sociology, Irbid, Jordan, [3]Department of Biology, Imam Mohammad Ibn Saud Islamic University (IMSIU), Kingdom of Saudi Arabia, Saudi Arabia

Corresponding author:
Khatib AJ
Department of Legal Medicine Toxicology and Forensic Medicine
Jordan University of Science and Technology
Irbid, Jordan
E-mail: sajalkhatib@just.edu.jo

Received: 01-Jul-2022,
Manuscript No. AMHSR-22-74619;
Editor assigned: 04-Jul-2022,
Pre QC No. AMHSR-22-74619(PQ);
Reviewed: 18-Jul-2022,
QC No. AMHSR-22-74619;
Revised: 25-Jul-2022,
Manuscript No: AMHSR-22-74619(R);
Published: 01-Aug-2022,
DOI: 10.54608.annalsmedical.2022.64.

Abstract

Malabsorption is a very important topic that impacts the health of people all over the world. The main objective of the present study is to review the literature regarding malabsorption and the role of microbes in malabsorption. Malabsorption can be attributed by several factors such as bacteria, vitamins, and disturbance of intestinal mucosa. The present study focused on microbial reasons due to their species diversity including bacteria and parasites. It seems that microbial origin has become hidden with time and not well considered in clinical practice. In some parts of the world, parasites are still existing and their role in malabsorption can not be ignored.

Keywords: Malabsorption; Microbes; Parasites; Bacteria; Mucosa

Introduction

The gut absorbs fats, carbs, proteins, vitamins, minerals, and trace elements. Malabsorption is impaired nutrient absorption anywhere, and maldigestion is impaired nutrient digestion in the intestinal lumen or at the brush border. Digestion and absorption are interdependent, but malabsorption and maldigestion differ. In much literature, "malabsorption" refers to interdependent processand[1].

Any digestion/absorption defect can cause malabsorption. These defects can be caused by a mucosal disease, conditions that damage the mucosa, congenital defects in the intestinal membrane transport systems, impaired absorption of specific nutrients, impaired GI motility (decreased peristalsis and stasis), disrupted bacterial flora, infection, or compromised blood flow or lymphatics. All nutrients or specific nutrients are impaired[2,3].

Impaired nutrient absorption often occurs in the small intestine, which has a large surface area and lumen. Gall bladder, pancreas, blood vessels, and lymphatics have direct connections to the small intestine and aid in digestion and absorption. Mechanical mixing, enzyme synthesis, enzyme secretion, enzymatic activity, mucosal integrity, blood supply, intestinal motility, and a balanced microbial flora help with digestion and absorption. Malabsorption syndromes present with diarrhea, steatorrhea, unintentional weight loss, developmental delay or skeletal deformities (in children), and anemia. Treatment and symptom management for malabsorption syndromes depend on etiology. This article covers digestion, absorption, and multiple malabsorption syndromes, but is not exhaustive[2,4].

Etiology

Nutrient absorption is luminal, mucosal, and postabsorptive. Malabsorption syndromes are categorized by stage. Mechanical mixing and digestive enzymes occur in luminal phase. Mucosal absorption requires a functioning mucosal membrane. Intact blood supply and lymphatic system aid postabsorptive phase. This discussion briefly addresses general digestion and absorption components and gives examples of malabsorption diagnoses according to which nutrients are affected[4].

Small Intestinal Bacterial Overgrowth (SIBO) is a disruption of the small bowel's normal ecology. Certain bacteria deconjugate bile acids, preventing fat absorption. Atrophic gastritis or proton pump inhibitors may cause bacterial overgrowth (PPIs). PPIs can hinder vitamin B12 absorption (rarely to a clinically significant degree). SIBO can also be caused by lactose deficiency, blind loops from inflammatory processes like IBD, GI stasis, or medical conditions that lead to gastric dumping of too-basic food. SIBO is patchy, unlike celiac disease's diffuse distribution. SIBO can cause brush border damage and antigliadin antibodies, which can mimic celiac disease. Nutrient malabsorption occurs[5].

Bacterial Malabsorption

Bacterial malabsorption is often caused by Giardia lamblia (giardiasis), Tropheryma whipplei, Cryptosporidium parvum (cryptosporidiosis), and the Phylum Microspora (microsporidiosis)[4].

Discussion

B vitamins and malabsorption

B vitamins coenzyme many cellular reactions. Energy production, methyl donor generation, neurotransmitter

How to Cite this Article: Khatib AJ, et al. Microbiological Role of Malabsorption: A New Medical Hypothesis. Ann Med Health Sci Res. 2022;12: 289-290.

synthesis, and immune functions. Due to their widespread roles, vitamin deficiency affects metabolism. B vitamins play novel roles in gut microbial ecology and intestinal health. This review examines the functional roles and biosynthesis of B vitamins and how they affect gut microbiota growth. We identified gut bacteria that produce vitamins and described their biosynthesis. B vitamin deficiencies affect intestinal morphology, inflammation, and intestinal disorder[6]. Our gut is important. It transports and absorbs food[7]. Bacteria, eukarya, and archaea live there. They're called "gut microbiota." Bacteroidetes and Firmicutes are dominant, with Actinobacteria, Proteobacteria, and Verrucomicrobia as minorities[8,9]. They protect the host from harmful pathogens[10]. They boost energy use through intestinal fermentation and regulate immune function and signaling molecules[11,12]. Human gut microbiota is unique, stable, and change-resistant [13]. Despite this, their composition changes over time[14]. Birth method[15,16], host age, lifestyle, medications, and diet all affect the gut microbiota [17-20].

Our gut bacteria also produce biotin, cobalamin, folate, niacin, pantothenate, pyridoxine, riboflavin, and thiamin. Auxotrophic bacteria compete with gut bacteria that need specific vitamins for growth. Vitamin deficiencies impair cellular metabolism and cause chronic diseases in humans. B vitamins are essential for the host and gut bacteria. The host needs a daily supply of these vitamins. B vitamins shape gut microbiota diversity and richness. A healthy gut microbial ecology has been shown. It's important to separate gut microbiota from a healthy gut[21].

Metronidazole is a synthetic antibiotic derived from Actinobacteria and Proteobacteria's azomycin. This chemical was used to treat trichomoniasis in 1959[22]. Metronidazole also treats dysentery and liver abscesses caused by Entamoeba histolytica. It was also effective against Giardia lamblia, which causes malabsorption and epigastric pain[23]. Oral, injectable, vaginal, and rectally administered metronidazole are mostly utilized. The liver hydroxylates, acetylates, and glucuronizes metronidazole, while kidneys excrete metabolites[22]. Metronidazole was released in 1959 to treat trichomoniasis, but new pharmacological characteristics were discovered[24] .

Conclusion

The present study discussed two important aspects: malabsorption and its causes. Nowadays people in different areas suffer from malabsorption and one of the main etiological reasons is the microbial involvement. Due to the diversity of microbial species involved in malabsorption, bacteria and parasites, their role has taken the attention to be considered.

References

1. https://www.ncbi.nlm.nih.gov/books/NBK553106/.
2. Owens SR, Greenson JK. The pathology of malabsorption: Current concepts. Histopathology. 2007; 50:64-82.
3. Konturek PC, Brzozowski T, Konturek SJ. Stress and the gut: Pathophysiology, clinical consequences, diagnostic approach and treatment options. J Physiol Pharmacol. 2011; 62:591-9.
4. Clark R, Johnson R. Malabsorption Syndromes. Nurs Clin North Am. 2018; 53:361-374.
5. Fujimori S. What are the effects of proton pump inhibitors on the small intestine?. World J Gastroenterol. 2015;21:6817-9.
6. Hossain KS, Amarasena S, Mayengbam S. B vitamins and their roles in gut health. Microorganisms. 2022;10:1168.
7. Thursby E, Juge N. Introduction to the human gut microbiota. Biochem J. 2017;474:1823–1836.
8. Marchesi JR. Prokaryotic and eukaryotic diversity of the human gut. Adv Appl Microbiol. 2010; 72: 43–62.
9. Arumugam M, Raes J, Pelletier E, Le Paslier D, Yamada T, Mende DR, et al. Enterotypes of the human gut microbiome. Nature. 2011;473:174–180. [Crossref], [Google Scholar]
10. Bäumler AJ, Sperandio V. Interactions between the microbiota and pathogenic bacteria in the gut. Nature. 2016;535:85–93.
11. Den Besten G, van Eunen K, Groen AK, Venema K, Reijngoud DJ, Bakker BM. The role of short-chain fatty acids in the interplay between diet, gut microbiota, and host energy metabolism. J Lipid Res. 2013; 54:2325–2340.
12. Gensollen T, Iyer SS, Kasper DL, Blumberg RS. How colonization by microbiota in early life shapes the immune system. Science. 2016; 352:539–544.
13. Dogra SK, Doré J, Damak S. Gut microbiota resilience: Definition, link to health and strategies for intervention. Front Microbiol. 2020;11:572921.
14. O'Toole PW, Claesson M. Gut microbiota: Changes throughout the lifespan from infancy to elderly. Int Dairy J. 2010; 20:281–291. [Crossref], [Google Scholar]
15. Biasucci G, Benenati B, Morelli L, Bessi E, Boehm G. Cesarean delivery may affect the early biodiversity of intestinal bacteria. J Nutr. 2008;138:1796S–1800S.
16. Neu J, Rushing J. Cesarean versus vaginal delivery: long-term infant outcomes and the hygiene hypothesis. Clin Perinatol. 2011; 38:321–331.
17. Odamaki T, Kato K, Sugahara H, Hashikura N, Takahashi S, Xiao JZ, ety al. Age-Related changes in gut microbiota composition from newborn to centenarian: A cross-sectional study. BMC Microbiol. 2016; 16: 90.
18. Jernberg C, Löfmark S, Edlund C, Jansson JK. Long-Term impacts of antibiotic exposure on the human intestinal microbiota. Microbiology. 2010;156:3216–3223.
19. Heiman ML, Greenway FL. A healthy gastrointestinal microbiome is dependent on dietary diversity. Mol. Metab.2016; 5:317–320.
20. Rogers MAM, Aronoff DM. The influence of non-steroidal anti-inflammatory drugs on the gut microbiome. Clin Microbiol Infect. 2016; 22:178.e1–178.e9.
21. Uebanso T, Shimohata T, Mawatari K, Takahashi A. Functional roles of B-vitamins in the gut and gut microbiome. Mol Nutr Food Res. 2020; 64:2000426.
22. Ceruelos AH, Romero-Quezada LC, Ruvalcaba Ledezma JC, López Contreras L. Therapeutic uses of metronidazole and its side effects: An update. Eur Rev Med Pharmacol Sci. 2019; 23: 397-401.
23. SamuelSon J. Why metronidazole is active against both bacteria and parasites. Antimicrob Agents Chemother. 1999; 43: 1533-1541.
24. Müller M. Mode of action of metronidazole on aerobic bacteria and protozoa. Surg. 1983;93:165171.