Austin Journal of Obesity & Metabolic Syndrome

Open Access

Austin Publishing Group

Mini Review

Gut Microbiota and Obesity

Takalkar UV*
Chief Medical Director, United CIIGMA Hospital, Aurangabad, Maharashtra, India

***Corresponding author:** Unmesh Vidyadhar Takalkar, United CIIGMA Hospital, Aurangabad, Maharashtra, India

Received: March 22, 2017; **Accepted:** March 31, 2017; **Published:** April 05, 2017

Abstract

Obesity has been linked with the imbalances in the composition of gut microbiota which may be either species or genus specific. Gut microbiota has extremely complex composition comprising of more than thousands of different microbial species. Recent evidences revealed that gut microbial alteration in composition and diversity contribute significantly in etiopathogenesis of obesity and related metabolic disorders. Age, lifestyle, wide range of dietary habits and geographical origin of the people may have an impact on microbial ecology of the human gut. Link between gut microbiota and obesity has been proposed through various mechanisms. Differences in the composition of intestinal bacterial in obese and normal weight individuals seem to be key factor in energy homeostasis. Modulation of gut microbiota by supplementation of prebiotics and probiotics can be a potential therapeutic target in the management of obesity and overweight. As intestinal microbiota plays important role in obesity, energy homeostasis and inflammation; its use in weight reduction seems to be promising tool for researchers. Research investigating mechanism of exact interaction of gut microbiota with body weight and energy homeostasis is in infancy. But in future, modulation of gut microbiota with the help supplementation of prebiotics and probiotics appears to be safe promising adjunct in the management of obesity.

Keywords: Gut; Microbiota; Obesity; Probiotics

Introduction

Obesity is a condition of abnormal or excessive deposition of fat that may impair health due to imbalance in energy consumption and expenditure. With the wave of urbanization and dramatically changed lifestyle worldwide, there is surge in the prevalence of obesity at rapid pace. World Health Organization has declared global epidemic of obesity, which is a serious threat to healthcare sector. Its prevalence has been doubled since 1980 with 35% prevalence of overweight and 11% of obese adults. It has been estimated that globally there are more than 1 billion overweight adults, out of which at least 300 million are obese. Also in the pediatric age group, the rising prevalence of obesity is becoming a big challenge. In spite of extensive research and social awareness about obesity and its related comorbidities, it is least understood medical entity in terms of its etiopathology. Obesity and overweight are the underlying risk factors for number of non communicable disorders like cardiovascular diseases, Type 2 Diabetes Mellitus, various kinds of malignancies, cerebrovascular diseases, osteoarthritis, gall stones, gout and sleep apnea. Obesity has been considered as fifth leading risk factor for global deaths killing approximately 2.8 million adults per year [1].

Link between gut microbiota and obesity

Various causes are responsible for the development of complex disease of obesity like environmental, lifestyle factors and genetic susceptibility. Besides these, endocrinal, neural factors and some infectious agents have been proposed as causes of obesity [2]. Consumption of energy dense food with poor nutrients and lack of physical activity are the key causes for surplus energy in body. Gut microbiota that is bacterial flora normally present in human gastrointestinal tract affect absorption of nutrients and energy regulation. With the aid of advanced next generation high throughput sequencing technologies and mechanistic testing in gnotobiotic mice, gut microbiota has received significant attention in relation to the development, prevention and treatment of obesity [3]. Obesity has been linked with the imbalances in the composition of gut microbiota which may be either species or genus specific. Gut microbiota has extremely complex composition comprising of more than thousands of different microbial species. It plays number of significant roles in digestion, metabolism, extraction of nutrients, and synthesis of vitamins. Also it provides protection by preventing colonization of pathogens and modulation of immune system [4]. Apart from this, the function of fermentation of undigested components from food has attracted the researchers to use it as a potential target for probiotics in weight management by energy salvage [5]. Gut microbiota harbors large amount of bacterial population in intestine and colon around 10-12 microorganisms per gram of content. 95% of them are anaerobes [6]. Recent evidences revealed that gut microbial alteration in composition and diversity contribute significantly in etiopathogenesis of obesity and related metabolic disorders. Age, lifestyle, wide range of dietary habits and geographical origin of the people have impact on microbial ecology of the human gut [7].

Link between gut microbiota and obesity has been proposed through many mechanisms. Human gut microbiota provides approximately 5-10% of energy needs through fermentation of undigested food components. So differences in composition of microbiota may affect the amount of energy harvested from the food consumed [8]. Systematic review by Angelakis et al reported increased levels of different bacterial population in obese and lean individuals [7]. Dietary calories restriction has impact on composition of intestinal bacterial flora and weight loss in obese persons [9]. One of the study

Citation: Takalkar UV. Gut Microbiota and Obesity. Austin J Obes & Metab Synd. 2017; 2(1): 1006.

reported more microbes of the phylum Firmicutes harboring in obese individuals, while lean harbored more bacteroidetes. These findings suggest that Firmicutes are more efficient in harvesting energy from indigested part of food than bacteriodetes [10]. A difference in the composition of intestinal bacterial flora in obese and normal weight individuals seems to be a key factor in energy homeostasis. Another theory postulated to link obesity with gut microbiota is the production of short chain fatty acids like butyrates, acetate and propionate from undigested polysaccharides. These compounds stimulate glucagon-like peptides and peptide YY which decrease gut motility allowing greater nutrients absorption. Research studies in mice demonstrated release of endotoxins like lipopolysaccharide (LPS) by intestinal flora on consumption of high fat diet. LPS is responsible for state of chronic low grade inflammation, hence it is a link between gut microbiota and metabolic disturbances of obesity [11]. Preclinical research results confirmed the role of intestinal microbiota in energy harvesting and storage. But such research findings in human being are in infancy stage [12].

Probiotics and prebiotics in the management of obesity

Primary therapy in the management of weight reduction includes therapeutic lifestyle change in the form of consumption of healthy diet with increased physical activity. But it needs strong desire and determination from the subjects. Pharmacological and surgical options can be prescribed, but these therapeutic modalities may be associated with some kinds of adverse effects. So modulation of gut microbiota by supplementation of prebiotics and probiotics is a potential therapeutic target in the management of obesity and overweight. Probiotics are the live microorganisms, which after entering the gut can exert beneficial health effects by improving its intestinal microbial ecosystem. The most commonly used probiotics are strains of Lactobacilli and Bifidobacteria administered as supplements. Also fermented food items and yoghurts are rich sources of probiotics [6]. Prebiotics are digestion resistant carbohydrates or food ingredients that resist degradation and absorption in upper gastrointestinal tract and selectively enhance the growth and activity of one or limited number of resident gut microbes which are beneficial to host [13].

Numbers of publications have been reported in the past few years about the role of manipulation of gut microbiota in the management of obesity with inconsistent results. Dietary pattern has strong impact on the composition of intestinal microbiota. Preclinical evidences for weight reduction have supported use of probiotics and prebiotics as therapeutic agents. Probiotics belonging to Lactobacillus genus have been widely used in the experimental studies to evaluate the effect of supplementation on body weight. Many researchers reported beneficial effects not only on obesity, but its associated metabolic derangements like insulin resistance, oxidative stress, glucose intolerance and non-alcoholic fatty liver [13,14].

Gut microbiota modulation by supplementing prebiotics and probiotics has arisen interest in clinical researchers also. It will be safe therapy for long-term use with good therapeutic tolerance. As intestinal microbiota plays important role in obesity in energy homeostasis and inflammation, its use in weight reduction seems to be promising tool for researchers. Kobyliak et al in their systematic review analyzed outcomes from 5 human trial studies in which Lactobacillus sub strains were used in Type 2 Diabetes Mellitus patients. They reported beneficial effects on the glycemic control, sensitivity of insulin and lipid profile also [15].

Gut microbiota modulation with the use of probiotics seems to be promising attractive strategy without adverse effects. But evidences from clinical studies are limited and hence well-designed multi-center based large sample sized preclinical and clinical studies with long-term follow-up are strongly warranted. Obesity is a multi factorial disease; hence gut modulation will serve as an adjunct along with current standard therapy.

Conclusion

Research investigating mechanism of exact interaction of gut microbiota with body weight and energy homeostasis is in infancy. But in future, modulation of gut microbiota with the help of prebiotics and probiotics appears to be safe promising adjunct in the management of obesity.

References

1. WHO. Obesity and overweight. Fact sheet N°311. 2014.
2. Tilg H, Moschen AR, Kaser A. Obesity and microbiota. Gastroenerology. 2009; 136: 1476-1483.
3. Backhed F, Ding H, Wang T, Hooper LV, Koh GY, Nagy A, et al. The gutmicrobiota as an environmental factor that regulates fat storage. Proc Natl. Acad. Sci. USA. 2004; 101: 15718–15723.
4. Purchiaroni F, Tortora A, Gabrielli M, Bertucci F, Gigante G, Ianiro G, et al. The role of intestinal microbiota and the immune system. Eur. Rev. Med. Pharmacol. Sci. 2013; 17: 323–333.
5. Zoetendal EG, Vaughan EE, et al. A microbial world within us. Mol. Microbiol. 2006; 59: 1639-1650.
6. Erejuwa OO, Sulaiman SA, and Ab Wahab MS. Modulation of Gut Microbiota in the Management of Metabolic Disorders: The Prospects and Challenges. Int. J. Mol. Sci. 2014; 15: 4158-4188.
7. Angelakis E, Armougom F, Million M & Raoult D. The relationship between gutmicrobiota and weight gain in humans Future. Microbiol. 2012; 7: 91–109.
8. Korczynska M, Kanaal N, Ouwehand AC. The gut microbiota and weight management Any role for probiotics?. Agro Food supplement. 2008; 5: 22-24.
9. Santacruz A, Marcos A, Warnberg J, et al. Interplay between weight loss and gutmicrobiota composition in overweight adolescents. Obesity. 2009; 17: 1906–1915.
10. Ley RE, Turnbaugh PJ, et al. Microbial ecology: human gut microbes associated with obesity. Nature. 2006; 444: 1022-1023.
11. Cani PD, Bibiloni R, Knauf C, Waget A, Neyrinck AM, Delzenne NM, et al. Changes in gut microbiota control metabolic endotoxemia-induced inflammation in high-fat diet-induced obesity and diabetes in mice. Diabetes. 2008; 57: 1470–1481.
12. Pedersen R, Ingerslev H-C, Sturek M, et al. Characterisation of Gut Microbiota in Ossabaw and Göttingen Minipigs as Models of Obesity and Metabolic Syndrome. Cotter PD, ed. PLOS ONE. 2013; 8: e56612.
13. Gibson GR. Prebiotics as gut micro flora management tools. J. Clin. Gastroenterol. 2008; 42: 75-79.
14. Rouxinol-Diasa AL, Pintob AR, Janeirob C, Rodriguesb D, et al. Probiotics for the control of obesity – Its effect on weight change. Porto Biomed. J. 2016; 1: 12-24.
15. Kobyliak N, Conte C, Cammarota G, Andreana P, Haley, Styriak I, et al. Probiotics in prevention and treatment of obesity: a critical view. Nutr & Metab. 2016; 13: 14.