

Impact of Low Fiber Diet on Gastrointestinal Disorders

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ABSTRACT

Fiber is not digested or absorbed in the small intestine. The main site of action of fiber is in the colon. In the colon, fiber will increase stool output and frequency, increase stool water, dilute the colonic content, reduce the toxins, bile acid, increase colonic fermentation and also stimulate probiotic growth.

Some meta-analysis of observational epidemiologic and case control studies have found a protective effect of dietary fiber against colon cancer that increase with intake. Therefore, the high fiber diet is healthy recommendation to prevent various gastrointestinal disorders.

Keywords: *dietary fiber - colon cancer - constipation*

INTRODUCTION

There is a current shift in the main cause of mortality and morbidity in Indonesia. Infectious diseases, which had always been the main cause of mortality and morbidity, has shifted and replaced by degenerative diseases such as heart disease, hypertension, diabetes, hypercholesterolemia, uricemia, cancer, and other degenerative diseases. Such condition is especially observable in the cities, particularly in Java. The results of the domestic health survey (*Survei Kesehatan Rumah Tangga - SKRT*) of the Department of Health of Indonesia in 1995 demonstrated that for the first time in the history of the SKRT, which started in 1972, the domination of infectious diseases in Java and Bali had been replaced by cardiovascular diseases. The results of this survey demonstrated that cause of death is now dominated by cardiovascular disease (24.2%) compared to infectious disease (22.8%).¹

As a cause of death, cardiovascular diseases do not only hit the elderly, but also has a tendency to affect the young. An important factor as a cause of this change in disease pattern is the unhealthy change in society's life style, such as lack of exercise, excessive consumption of sugar and fatty foods (high fat and carbohydrate diet), salty foods, lack of fiber, and other unhealthy habits such as cigarette smoking and drinking.

An unhealthy diet could cause diseases such as

coronary heart disease, stroke, diabetes, digestive disorders (constipation, hemorrhoids, colon cancer), tooth and gum decay, as well as overweight.²

How could fiber prevent these diseases? Fiber is a crucial nutritional component in our daily diet. In our digestive system, fiber affects the absorption of nutrients, carbohydrate and fat metabolism, forms feces and increases its excretion, influences various aspects of the structure and defense of the digestive mucosa, and also affects our immune system.³

The Transport of Fiber Through The Body

Fiber is not digested or absorbed in the small intestines. The main site of action of fiber is in the colon. As you may know, fiber is classified into soluble and insoluble fibers. Soluble fiber is fermented in the colon, while insoluble fibers play a role in forming the fecal mass. Fermentation of the fiber occurs in the upper colon, while feces formation occurs in the distal colon.³

Carbohydrate fermentation that occurs is conducted by normal (probiotic) bacterial micro flora of the colon. This micro flora completes the final digestion through this fermentation process. Aside from playing a role in carbohydrate fermentation, the micro flora also protects the colon from pathogens. During the carbohydrate fermentation, short chain fatty acids are produced, which act as an energy source for the health of the colon, stimulating water and salt absorption, improving blood

flow, reducing colon acidity, and maintaining the integrity of the colon wall.⁴

In addition to forming fecal mass, unfermented fiber also plays a role in shortening colonic transit time. This effect prevents exposure of the colon wall to toxic and carcinogenic substances that need to be promptly removed from the body.³

The role of fiber on the digestive tract can be found in Table 1.

Table 1. The Effect of Fiber in The Digestive Tract³

Small intestines	<ul style="list-style-type: none"> • Reduced blood cholesterol and triglyceride levels • Reduced the effect of blood sugar in carbohydrate-containing meals • Decreased calcium, magnesium, and iron resorption
Large intestines	<ul style="list-style-type: none"> • Reduced in colonic transit time • Increased the bowel frequency and volume • Increase the water in stool • Softened bowel content • Reduced toxins and bile acids • Increased in colonic fermentation • Increased in colonic short chain fatty acids • Stimulation probiotic growth

Digestive Disorders Attributed to a Low Fiber Diet

The epidemiological study by Burkitt et al in 1971 is a landmark in raising our awareness on the benefit of fiber for our health, particularly for our digestive tract. The study performed on Africans demonstrated that black Africans that consumed a high fiber low fat diet had a low mortality rate due to colon cancer compared to white Africans with a low fiber high fat diet. The results of this study demonstrated that a high fiber diet has a protective effect for the incidence of colon cancer.⁵

Colon cancer is a health problem in Western countries. Colon cancer is the fourth major cause of death due to cancer. In Indonesia, there has been increasing reports of colon cancer. A study at Dharmas Cancer Hospital, Jakarta, in 2001 found a prevalence rate of 15 (6.5%) from 232 colonoscopies performed.⁶ Ulin Regional General Hospital, Banjarmasin, reported 11 cases (32%) of 34 cases of anal bleeding that underwent colonoscopy.⁷ At Cipto Mangunkusumo General Hospital, there were 224 cases of colon cancer from 1996 to 2001. The largest number of cases was 50, which was in the year 2001, with an average age of 53.8 years.

Various studies demonstrated a correlation between the prevalence of colon cancer and a low fiber diet. Howe et al reported a meta-analysis of 13 published studies on

the correlation between the prevalence of colon cancer and a low fiber diet. The meta-analysis covered 5287 cases of colon cancer compared to 10,470 normal subjects, and demonstrated a reduction of almost 50% in the number of cases found among patients with a high fiber diet. The researchers estimated a prevalence reduction of 31% (approximately 50,000 cases per year) if the daily intake of fiber is increased 13 grams/day from the usual intake.⁸

Low fiber intake is also associated with bowel disturbance (constipation). According to medical consensus, a person is considered constipated if he or she experiences less than 3 bowel movements per week. Initially, patients do not pay much attention to their constipation. It is considered usual and normal. The patient seeks medical attention only after constipation results in bloody stools due to hemorrhoids, diverticular disease, or colon ulcer or anal fissure. Constipation is usually accompanied by other symptoms such as lower abdominal pain (particularly of the lower left side), feeling of fullness and gassiness. Prolonged constipation may be fatal, causing colon obstruction by hardened fecal mass, finally causing an internal wound and colon rupture.

Table 2. Complication of Constipation

Hemorrhoid
Anal fissure
Diverticle
Lower colon ulcer
Hardened feces
Colon strangulation
Colon rupture
Chronic colon inflammation
Difficulty urinating

If the cause of constipation is a low fiber intake, increased fiber intake of 20-30 grams could usually alleviate the condition. Fiber intake increase fecal mass, bowel frequency and reduces transit time through the digestive tract. Water intake should also be increased to alleviate the condition. Thus, the complications of constipation could be prevented.

Another bowel disease that is rarely found in Indonesia is Inflammatory Bowel Disease (IBD), which usually causes patients to come with complaints of chronic diarrhea accompanied with bloody stools with mucus. Once the patient's condition settles, he or she is advised to increase fiber intake to prevent recurrence and severe complaints. The high fiber diet recommended includes foods containing flour, nuts, fruits, vegetables, and potatoes. The reason for the choice of these foods

is because bowel fiber ties the toxins that aggravate inflammation in IBD.⁹

CONCLUSION

In relation to the digestive tract, fiber is generally classified into soluble and insoluble fiber. These two kinds of fiber have separate roles that are important not only for the health of the digestive tract, but also for the general healthy body.

Fiber plays a role in the formation of fecal mass, reducing fecal excretion, reducing toxins and unused substances from the colon, plays a role as a prebiotic, to increase carbohydrate fermentation, and to reduce the levels of cholesterol, triglyceride, and blood sugar.

Inadequate fiber consumption may cause various diseases to develop in the gastrointestinal tract as well as its complications. A low fiber diet is associated with increased prevalence of colon cancer. Thus, a high fiber diet of 30 grams/day and adequate water intake is a healthy recommendation for us to avoid various diseases and to a better performance of our daily life.

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