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DIETARY FIBER IMPORTANCE IN FOOD AND IMPACT ON HEALTH

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Abstract

Dietary fibre is a non-digestible part of plant material in the diet which is resistant to enzymatic digestion in humans which includes cellulose, non-cellulosic polysaccharides such as hemicellulose, pectic substances, gums, mucilages and a non-carbohydrate component lignin. The diet rich in fibre such as cereals, nuts, fruits and vegetables have a positive effect on health since their consumption has been related to decreased incidence of several diseases. Higher intakes of dietary fiber are linked to less cardiovascular disease, diabetes, obesity, intestinal cancer, constipation, and other disorders that have serious adverse effects on the health of human beings and also higher intakes of fiber are linked to lower body weights. So improvement of diet with high fiber will help in maintaining good health when consumed in the required amount.

Keywords: Dietary Fiber; Health; Constipation.

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1. Introduction

In the present days with the improved standard of living people diet has also become increasingly sophisticated. Along these, concerns about food and diet and its quality and quantity and its impact on health also became highly worried. Hence taking care of health by adopting good diet with all the essential nutrients is every important. Now days for so many health problems people prefer the fiber rich and omega fatty acid rich products due to their health benefits. In this review we described about dietary fiber its classification and its sources, also described about possible adverse effects when it is low in diet and its impact and how to overcome and its application.

2. Dietary Fiber and Its Classification and Sources

Dietary fiber is primarily derived from a plant material and is composed of complex, non-starch carbohydrates and lignin that are not digestible within the small intestine because mammals do

not produce enzymes capable of hydrolyzing them into their constituent monomers (N. D. Turner and J. R. Lupton, 2011). It is also referred as the non-digestible form of carbohydrate found in plant foods, including fruits and vegetables, whole grain products, beans, nuts and seeds, which provide bulk in the diet, and helps to promote healthy gastrointestinal function and has the ability to prevent or relieve constipation and contributes to a feeling of fullness after eating (M. Katherine, et al. 2014).

2.1. Dietary Fiber is Normally Classified as Soluble and Insoluble Fibers

Soluble fiber: These are the one which dissolves in water to form a gel-like material, which helps in lowering blood cholesterol and glucose level.

Sources: oats, peas, beans, apples, citrus fruits, carrots, barley and psyllium.

Insoluble fiber: These are the one which does not dissolve in water. These types of fibers promotes the movement of material through digestive system and increases stool bulk, hence helps to those who struggle with constipation or irregular stools.

Sources: Whole-wheat flour, wheat bran, nuts, beans and vegetables, such as cauliflower, green beans and potatoes, are good sources of insoluble fiber.

Table 1: Classification of dietary fiber, (Joanne Slavin, 2013)

Fibers	Classification
Soluble Fibers	B-glucans, Gums, Wheat dextrin, Psyllium, Pectin, Inulin
Fermentable Fiber	Guar gum, B-glucans, Wheat dextrin, Pectins, Inulin
Viscous Fibers	Pectins, B-glucans, Some gums (e.g., guar gum), Psyllium
Functional Fiber	Resistant dextrins , Psyllium, Fructooligosaccharides Polydextrose, Isolated gums, Isolated resistant starch
Insoluble Fibers	Cellulose, Lignin, Some pectins, Some hemicelluloses
Non-fermentable Fibers	Cellulose, Lignin
Non-viscous Fibers	Polydextrose, Inulin

2.2. Dietary Fiber in Foods

Dietary fiber are naturally present in most cereals, vegetables, fruits and nuts and only the amount and composition of fibers differ from food to food. Since a fiber-rich diet are lower in energy density and often has a lower fat content, with larger volume and richer in micronutrients. Hence it creates a larger mass of food, which takes longer time to eat and its presence in the stomach may bring a feeling of satiety sooner, although this feeling of fullness is short term (Dhingra et al, 2012). Fibers, also known as roughage or bulk, which are sugars and starches derived from plants. Mainly fruits, vegetables, whole grains and legumes, such as peas and beans, are delicious sources of fiber. Another way to get fiber was through natural supplements such as psyllium, which are made from the seed of a shrub-like herb.

3. Benefits of High Fiber Diet

Unlike protein and fat, our body does not digest and absorb fiber. But rest assured, as fiber passes unchanged through our stomach and small intestine into the large intestine (colon), it is working hard to keep us healthy. Depending on our age and gender, nutrition experts recommend

you eat at least 21 to 38 grams of fiber per day for optimal health (Wacker Drive). Numerous non-starch foods provides up to 20–35 g of fiber/100 g dry weight and others those containing starch provides about 10 g/100 g of dry weight and the content of fiber of fruits and vegetables is 1.5–2.5 g/100 g of dry weight (Selvendran and Robertson 1994). Lambo et al. (2005) reported, cereals are one of the main sources of dietary fiber, contributing to about 50% of the fiber intake in western countries, whereas 30–40% are may come from vegetables, about 16% from fruits and the remaining 3% from other minor sources.

Changing lifestyle, led to many diseases which may caused due to an imbalanced diet, such as diabetes, cardio cerebro vascular disease, obesity, intestinal cancer, constipation, and other disorders that have serious adverse effects on the health of human beings (Britt Burton-Freeman, 2017). Dietary fiber has many functions in diet, one of which may be to aid in energy intake control and reduced risk of all the above diseases.

3.1. Some of the Benefits of High-Fiber Diet, Which Include

Dietary fiber is an abundant source of nutrients including vitamins, minerals, and digestible energy. In addition, they also contain phytochemicals such as phenolics, carotenoids, lignans, beta-glucan and inulin. These phytochemicals which are secreted by plants, are not currently classified as essential nutrients but they may have been important factors in human health. The synergistic effect of phytochemicals, increased nutrient content and digestive properties, are believed to be the mechanism behind dietary fibers beneficial effects on the treatment and prevention of obesity and diabetes reduced CVD and decreased incidence of certain types of cancer (James M. Lattimer and Mark D. Haub, 2010)

3.1.1. Normalizes Bowel Movements

Dietary fiber increases the weight and size of our stool and softens it. A bulky stool is easier to pass, decreasing a chance of constipation. If there is loose, watery stools, fiber may help to solidify the stool because it absorbs water and adds bulk to stool.

3.1.2. Diarrhea

Fiber can be used to relieve mild-to-moderate diarrhea. Soluble fiber soaks up water in the digestive tract, which makes stool firmer and slower to pass (Steven D. Ehrlich,)

3.1.3. Diabetes

Type two of diabetes has increased exponentially over the past several years, which is resulted from decreased insulin sensitivity and hyperglycemia. For which reason, a primary dietary factor of particular concern was carbohydrate intake (James M. Lattimer and Mark D. Haub, 2010). An increase in the intake of dietary fiber, predominantly of the soluble type, by patients. with type 2 diabetes mellitus improved glycemic control and decreased hyper insulinemia in addition to the expected lowering of plasma lipid concentrations (Manisha chandalia, 2000). Hence a healthy diet that includes insoluble fiber may also reduce the risk of developing type 2 diabetes.

3.1.4. Obesity

Fiber intake associates with beneficial lifestyle factors, such as fruit and vegetable intake and exercise habits. Diets that are high in fiber are typically lower in fat and energy density, both of which are helpful for maintaining a healthy body weight (Joanne Slavin, 2013). High-fiber foods tend to be more filling than low-fiber foods, so there will be likely to eat less and stay satisfied longer. They also tend to take longer to eat and to be less "energy dense," which means they have fewer calories for the same volume of food.

3.1.5. Lowers Cholesterol Levels

Soluble fiber found in beans, oats, flaxseed and oat bran helps to lower total blood cholesterol levels by lowering low-density lipoprotein, or "bad," cholesterol levels. Some studies also have shown that high-fiber foods may have other heart-health benefits, such as reducing blood pressure and inflammation.

4. Impact of Low Fiber Diet on Health

The recommended daily intake of dietary fiber is 25 grams of fiber for women and 38 grams for men. When there is imbalance in diet or low intake of dietary fiber will lead some health issues which may stay for long life. Some of the long term risks associated with low fiber diet are constipation which is the result of dietary fiber deficiency. When its effect prolonged it may lead to Hemorrhoids (which is caused by straining to empty bowels). Chronic constipation and straining may also lead to diverticular disease, a painful condition in which pouches form in the colon and can become inflamed (Tonia Reinhard, 2014). Some studies showed that there is inverse relationship between fiber intake and the incidence of heart attack, hence one who consumes least dietary fiber were more at the risk of heart attacks. Dietary fiber is also known for its impact on satiety, which is a sensation of fullness. Food that is lower in fiber is less satiating than a diet higher in fiber. Because fiber tends to affect appetite, it has been studied for its role in weight management. A study showed that fiber intake is inversely associated with subsequent weight gain and a higher waist circumference.

5. Methods or Tips to Overcome the Low Fiber Health Effects

Some of the simple ways to overcome adverse effects of low fiber diet are adopting a lifestyle which provides enough dietary fiber for maintaining the normal and better health. Many whole plant foods are rich in different types of dietary fiber, such as pectin, gum, mucilage, cellulose, hemicellulose, lignin, and soluble fiber, hence consuming a variety of fibers is suggested to gain the maximum benefits of a high-fiber diet. Replace white rice, bread, and pasta with brown rice and whole grain products.

Bran: Bran from many grains is very rich in dietary fiber. Oat bran is high in soluble fiber, which has been shown to lower blood cholesterol levels. Wheat, corn, and rice bran are high in insoluble fiber, which helps prevent constipation.

Beans: Beans are real magical fruit. They are one of the most naturally rich sources of fiber, as well as protein, lysine, vitamins, and minerals, in the plant kingdom.

Berries: They are packed with tiny seeds; their fiber content is typically higher than that of many fruits. Example: Raspberries, raw 1 cup 8 g, Blueberries, Currants (red and white), Gooseberries, Blackberries

Whole grains: One of the easiest ways to increase the fiber intake is to focus on whole grains. A grain in nature is essentially the entire seed of the plant made up of the bran, germ, and endosperm. Refining the grain removes the germ and the bran; thus, fiber, protein, and other key nutrients are lost. The Whole Grains Council recognizes a variety of grains and defines whole grains or foods made from them as containing "all the essential parts and naturally-occurring nutrients of the entire grain seed. If the grain has been processed, the food product should deliver approximately the same rich balance of nutrients that are found in the original grain seed." (Sharon Palmer, 2008).

6. Conclusion

Dietary fiber consists of many different constituents, however; some are of particular interest and include arabinoxylan, inulin, β -glucan, pectin, bran and resistant starches. These individual components of dietary fiber have been shown to significantly play an important role in improving human health. Dietary fibers exhibit a diverse range of physiochemical properties and corresponding physiological effects. The role of fiber in health has extended far beyond improved laxation, and includes benefits on risk factors for cardiovascular disease, weight management, immune function, and colonic health. Since fiber intakes around the world are less than half of recommended levels, increasing fiber consumption for health promotion and disease prevention is a critical public health goal. A large amount of research has reported an inverse relationship between fiber consumption and the risk for coronary heart disease and several types of cancer. A high level of fiber intake has health-protective effects and disease-reversal benefits. Persons who consume generous amounts of dietary fiber, compared to those who have minimal fiber intake, are at lower risk for developing CHD, stroke, hypertension, diabetes, obesity, and certain gastrointestinal diseases. Hence further studies should be done to know the way to increase the fiber content in the diet.

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