



Functional Foods for Reducing the Risk of Various Chronic Diseases

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Abstract - Global epidemic of obesity is growing at an unprecedented pace and has become one of the world's most important public health issues. Obesity contributes to multiple metabolic conditions, such as respiratory problems, elevated blood pressure, and diabetes. Obesity is a disease often induced by bad eating and an unhealthy lifestyle. Globally more than 650 million obese and 1.9 billion overweight people. It is necessary to have an alternative food that is fast and practical in its preparation but meets the standard nutritional requirements for healthy living. Breakfast is important for the body because it can restore blood glucose levels so that improve memory and concentration level well. Regardless of the benefits of breakfast, people's busy schedules in recent times have resulted in ignoring breakfast. For this reason, this Study shows health benefits of some plant based functional food to reduce the risk of various chronic diseases (Obesity).

Keywords: Functional Food, chronic diseases, Brown Rice, Chia seeds, Ginger, Red kidney beans, Obesity

I. INTRODUCTION

The global epidemic of obesity is growing at an unprecedented pace and has become one of the world's most important public health issues. It is predicted that by 2030, 38 % of the world's adult population would be overweight without effective intervention[14]. There are several influences correlated with obesity and metabolic disorders, including genetics and physiological differences (gender and age), living environments and habits (diet, stress, smoking, alcohol and exercise)[14]. Obesity contributes to multiple metabolic conditions disorders, such as pathologies linked with inflammation, cardiovascular diseases, hypertension, coronary problems, obesity and diabetes mellitus. For the management of obesity, a dietary change and herbal solutions may be used to prevent their adverse effects, instead of medications. The prevention or management of chronic diseases is a major health care priority since they account for nearly 60% of all deaths worldwide (WHO). Thus nutrition, through functional foods is an attractive therapeutic alternative to deliver dietary components capable of managing chronic disease, especially in light of the increasing cost of health care [23].

Breakfast is one of the most important meals of the day it can restore blood glucose levels so that improve memory and concentration level well. Regardless of the benefits of breakfast, people's busy schedules in recent times have resulted in ignoring breakfast. For this reason, it is necessary

to have an alternative food that is fast and practical in its presentation but meets the nutritional standard requirements [19]. Breakfast flakes (BMF)

is a popular product and can be produced anywhere in the world. It is consumed by all ages and at all times because it is a delicious meal and ready-to-eat. The breakfast flakes on the markets are produced from cereals and contain high percentage of carbohydrates [19]. Other sources of ingredients such as rice and kidney beans which contain both carbohydrates and good amount of protein can also be used to enrich the protein content of the food. The worldwide increase in the awareness about public health has necessitated so that, the search for functional foods with multiple healthy benefits and capable of acting on various biochemical targets with limited toxicity to reduce diseases and nutrition improvement [9]. This Study shows health benefits of some plant based functional food to reduce the risk of various chronic diseases (Obesity).

The concept of functional foods was proposed by a Japanese academic society in the early 1980's, and the legislation for the functional foods was first implemented as FOSHU, which means "Foods for Specified Health Use". The Functional Food Center, USA (FFC) previously defined functional foods as scientifically proven benefits towards improving overall health and mitigating the effects of chronic disease. Functional foods are based on attribution of a health benefit so that, Health benefits range from supporting the immune system to infections, such as the latest COVID-19, and applications in improving mental health to improving public health and treating chronic diseases and their symptoms such as obesity, type 2 diabetes, etc. As is evident in the definition by the FFC, It is important that the development of functional food has a rigorous, legitimate, and audited process focused on improving the health of billions of people [1]. The European Food Safety Authority (EFSA) defines functional foods as: "A food, which beneficially affects one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and well-being or reduction of risk of disease. Although there is no clear definition of functional foods so that, conventional foods, modified foods, and food ingredients are the primary categories of functional foods definitions [2].

Whole foods that may be functional due to the bioactive compounds it contains [2].

1. Modified foods: considered to be functional foods have been modified through factors involved in food production or

processing to modify the type, content, bioaccessibility or bioavailability of bioactive compounds [2].

2. Food ingredients that may be isolated and/or synthesized bioactive components that are used in food products to confer a functional effect [2].

I. SCIENTIFIC BASIS FOR FUNCTIONAL FOODS :

Functional effects and potential mechanisms may be evaluated through basic research (cell and animal studies) or clinical research (human studies). Typically requires a foundational knowledge of food, nutritional, and biological sciences to develop functional foods and identify mechanisms by which potential functional foods and functional effects to improve health and reduced chronic disease risk [2]. A functional food can be a natural food or a food to which a component has been added or removed by technological or biotechnological means [3]. These are not only well known yoghurts but also soft drinks, juices, sorbets, bread, cold meats, sausages, etc [4].

- Nowadays most popular functional food ingredients worldwide are:
 1. Probiotics, prebiotics and symbiotic
 2. Dietary fiber
 3. Omega 3 fatty acids, oleic acids and phytosterols
 4. Phytoestrogens
 5. Phenolic compounds

Brown rice

Brown rice is a rich source of various bioactive compounds, such as -oryzanol, tocopherol, tocotrienol, amino acids, dietary fibres and minerals. Inositol hexaphosphate is a naturally- occurring molecule found in brown rice. This compound has demonstrated anti-cancer Properties.

Selenium is a trace mineral, which is found abundantly in brown rice. The function of selenium is to induce DNA repair and combine in damaged cells to promote apoptosis, which is the self-destruction of the cells in the body to remove damaged and worn out cells. It also serves as a rich source of magnesium. Magnesium plays an important role in our body, as it works as a cofactor of more than 300 enzymes. About 21% of the daily value of magnesium can be obtained by consuming a cup of brown rice. It contains a high amount of dietary fiber and has a lower glycaemic index compared to white rice. Also it has vitamin E, mainly in two types of structure, which are tocopherols and tocotrienols. The function of vitamin E is antioxidant activity, maintenance of membrane integrity, DNA repair, immune support and metabolic processes [5].

1. Epidemiological studies suggest a strong association between increased consumption of whole-grain foods and reduced risk of diabetes and cardiovascular disease [7].
2. Colored rice varieties have been demonstrated to possess anti-inflammatory and antioxidant properties thus presenting rice as a potential candidate for nutraceutical and/or functional food alternatives. It has therapeutic characteristics that have been attributed to the presence of polyphenols that a subclass of

phytochemicals. Incorporation of polyphenols into diets through rice consumption could be as a potential complementary alternative for reducing the incidence of metabolic syndrome and its associated risk factors such as obesity [8].

3. Many studies have reported that brown rice also has anti-dyslipoproteinemia and cholesterol lowering effects in animal models. In a clinical study involving sixty Vietnamese women (aged 45–65 years) with impaired glucose tolerance, the impact of germinated brown rice intake on blood glucose and lipid profile was evaluated and observed an improvement in blood glucose and lipid level in brown rice diet group [5].

Chia seeds

Chia seeds are ‘functional food’ owing to the presence of α -linolenic acid (ALA), an essential precursor fatty acid of physiologically significant polyunsaturated fatty acids (PUFA). It also a promising source of antioxidants due to the presence of polyphenols, chlorogenic and caffeic acids, myricetin, quercetin, kaempferol as well as essential fatty acids, dietary fiber, lipids, protein, phenolic compounds, minerals and omega-3 fatty acids that play a key role in preventing the formation of clots and plaques in the arteries and so help to prevent cardiovascular diseases, maintaining healthy serum lipid and glucose levels [9].

The United States Department of Agriculture (USDA) has reported that chia seed contains 42.12% total carbohydrates (including 34.4% total dietary fiber), 30.74% total lipids, 16.54% protein, 5.8% moisture, and 4.8% ash. In addition, the seed contains high amounts (335–860 mg/100 g) of calcium, phosphorus, potassium, and magnesium, with lesser amounts (4.58–16 mg/100 g) of sodium, iron, and zinc [10].

1. The study showed a decrease in weight gain in experimental groups supplemented with ground chia seeds and its extracts. This indicates that chia seeds can be a good candidate for weight loss if executed with other therapeutic life changes such as reducing intake of foods and food products rich in saturated fats and trans-fatty acids; increasing intake of foods high in omega-3 fatty acids and dietary fiber including fruits and vegetables, reducing intake of sodium to less than 2400 milligrams per day and reducing physical inactivity [7].
2. The clinical studies suggest that chia seeds exert effects such as reducing postprandial glycemia, appetite, waist circumference, and cardiovascular risk factors. Such effects may be the result of their composition: chia seeds are a rich source of dietary fiber, which reduces the hunger sensation, and the omega-3, which is essential for the emulsification and absorption of the liposoluble vitamins A, D, E, and K. A (Toscano et al.2015). [11].
3. Chia seed diet in rats, reduced dyslipidemia and visceral adiposity. The chia diet caused lower triacylglycerol levels, increased HDL cholesterol and linolenic and it derived fatty acids in rat serum. Dietary chia seeds prevented the onset of dyslipidemia and insulin resistance (IR) in the rats fed with the sucrose-rich diet. Dietary chia seed also reduced the visceral adiposity [9].
4. Chia seeds capable of inhibiting pancreatic lipase an enzyme responsible for digestion of dietary fat. There is possibility of slowing down the digestion of fats after consumption of chia seeds/extract hence their release through feces. Inhibition of this enzyme is thought to improve dyslipidemia. Pancreatic lipase inhibitors are considered valuable therapeutic

Ginger

Ginger is an ancient medicinal plant of the family Zingiberaceae, formally recognized as *Zingiber officinale* Rosc and endemic to South-East Asia [12]. This is one of the oldest known treasured spices regarded as a therapeutic blessing from Allah, its pungency and aroma. Fresh ginger has been used for the treatment of nausea, cold-induced disease, colic, asthma, cough, heart palpitation, swellings, dyspepsia, loss of appetency and rheumatism. Medicinal properties associated with ginger are anti-inflammatory properties, anti-thrombotic properties, cholesterol-lowering properties, blood pressure-lowering properties, anti-microbial properties, anti-oxidant properties, anti-tumor properties, and hypoglycemic properties. Consumption of ginger also has beneficial effects on heart disease, cancer, hypertension, obesity, diabetes, osteoarthritis, and bacterial infections [13].

1. There is increasing evidence and studies showing that ginger have beneficial effects against obesity and related metabolic syndromes [14].
2. Dietary Ginger has shown beneficial effects against obesity and related metabolic disorders, and prevents body weight gain by remodeling whole-body energy metabolism and inducing browning of white adipose tissue [15].
3. Addition of dried lemon, ginger and cumin at certain levels 200mg/kg, respectively to the high fat diet decreased the body weights, in addition to significant decrease in the mean values total lipids profile, serum glucose level, and liver enzymes in all treated groups. The dried lemon, ginger and cumin are rich in antioxidants such as phenols and Flavones which plays an important role in reducing the level of lipids profile, serum glucose, and liver enzymes and are considered natural anti-obesity [16].

Red beans

- Red beans are known as a plant protein source. Red bean protein content is quite high, which is around 21-27% per 100 g of material [17]. It has a glycemic index value low. The glycemic index is an index (level) of food according to its effect in increase blood sugar levels. Glycemic value at kidney beans namely 26. A low glycemic index value is good for obesity and diabetes mellitus sufferers due to increased levels sugar in the blood is slow and peak low sugar content [18]. Fiber in kidney beans is a water soluble fiber that can reduce cholesterol levels and blood sugar levels [19]. Red kidney bean has alpha-glucosidase and alpha-amylase inhibiting activity which delays carbohydrate digestion [20]. Hence the selection of beans red is a good source of protein used for substitution in the manufacture of ready to- eat cereal or flakes [18].
- Red kidney bean flakes and red palm oil as ready-to - eat breakfast for patients with diabetes. Recommend that the drug produced should be viewed as an ideal breakfast for diabetic patients, as it exhibits possible hypoglycemic and antioxidant properties as well as having high fiber content and the energy and macronutrients needed. Red kidney bean has alpha-

glycosidase and alpha-amylase inhibiting behavior that slows the absorption of carbohydrates while red palm oil has antioxidant activity that can neutralize oxidative stress in patients with diabetes [20].

Grains and legumes

Grains and legumes in general play an important role in human nutrition. Grains are low in protein, fat and dietary fiber, but rich in starch. Legumes are rich in nutrients, as they are high in protein and fiber and low in fat. They are excellent sources for carbohydrate digestion and slow absorption and are an important source of vitamins and minerals, although pulses and grains are deficient in some essential amino acids. A mixture of legumes and some grains such as rice, one of the major cereal crops worldwide, provide a balanced protein with a high biological value. It is a good alternative in manufacturing products for obese, celiac patients, vegetarian diets and a consumer who understands the importance of a healthy diet [21]. Moreover, health organizations such as the Food and Agriculture Organization of the United Nations (FAO) recommend pulses as staple foods to fulfill the basic protein and energy requirements of the human diet [22].

II. FUNCTIONAL FOODS IN YOUR DIET

Including an abundance of plant foods as well as healthy protein and dairy foods in your diet is a sure way to increase your intake of functional foods. Consider these tips:

1. Fill most of your plate with plant foods :
Fill half of your plate with fruits , vegetables and whole grains, beans, nuts, and soy. Phytochemicals are specific type of bioactive compounds that are found in plant foods such as fruits, vegetables, nuts, and whole grains, so by consuming more of these foods on a regular basis, will help to increase consumption of health promoting phytochemicals [2].
2. Choose a variety of colors
Foods with the most vibrant colors that have the most abundant source of beneficial phytochemicals. However, white and colorless foods such as garlic and onions are rich in health- promoting phytochemicals. By consuming many different colors of plant foods, the more likely it is that you will consume a larger variety of phytochemicals[2].
3. Select a variety of foods
Choose a variety of foods within each food group (fruits, vegetables, whole grains such as rice, wheat, quinoa, and oats). Vary proteins in your diet including fish, poultry, soy, beans, and nuts. Dairy: milk, yogurt, cheese, and kefir [2].
4. Make foods in a variety of ways
 - a. Different preparation techniques can have different impacts on foods and their nutrients. For example,;
 - b. Vitamin C is sensitive to high heat, and some may be destroyed when heated.
 - c. Vitamin A is more stable to heat and may increase in availability when heated [2].
5. Lower Intake of Highly Processed Foods
Highly processed foods are low in vitamins, minerals, and bioactive compounds, but high in refined sugar, sodium, and saturated fat. Balance is the key to enjoying eating, while at the same time providing the body with the nutrients it needs to stay healthy and reduce the risk for disease[2].

Remember that there is no “magic bullet” when considering what to eat and how to best support health. No one food can provide all the essential nutrients needed to sustain life. The most benefits will come from eating a variety of foods, as they will provide a variety of essential nutrients and bioactive compounds [2].

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