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Role of Nutraceuticals in Management of Diabetes: A Review

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ABSTRACT

Nutraceuticals are regarded as bioactive food products that provide health as-well-as medical benefits such as prevention and treatment of diseases. The need of herbal medicine is increasing day-by-day. With the modernized, competitive and stressful conditions, all types of diseases are having a field day. Allopathic cure is available for most of the diseases but they are not cost-effective and associated with a variety of side effects. Therefore, many people are inclining towards change in lifestyle and use of herbal products. These products may range from processed foods, dietary supplements, genetically engineered foods, etc. Majority of the nutraceuticals are claimed to possess multiple therapeutic benefits though substantial evidence is lacking for benefits as-well-as unwanted effects.Nutraceutical agents have multidimensional therapeutic benefits and have been claimed to have effective disease preventing, curative and health promotive virtues. Several nutraceuticals used in clinical practice have been shown to target the pathogenesis of diabetes mellitus, metabolic syndrome and their complications and to favourably modulate a number of biochemical and clinical endpoints. Hypoglycaemic drugs are widely used in several traditional systems of medicine to prevent diabetes mellitus. This present article has been devoted towards better understanding of the basics about nutraceuticals which makes them instrumental in maintaining health ,act against various disease conditions and thus promote the quality of life.

Keywords : Nutraceuticals, Diabetes, Herbals, Dietary supplements, Functional foods

INTRODUCTION

The term nutraceutical was coined by Stephen DeFelice, founder and chairman of the foundation for Innovation in Medicine, located in Cranford, New Jersey (Lakshmana *et al.,* 2012). It combines the word nutrient (a nourishing food or food component) and pharmaceutical (a medical drug) . The word 'nutraceutical' is defined as any substance that may be considered as a food or part of a food and provides medical and health benefits, including the prevention and treatment of disease. Pharmaceuticals may be considered as the drugs used mainly to treat diseases, while nutraceuticals are those that are intended to prevent diseases. Both pharmaceuticals and nutraceuticals can cure and prevent diseases but only pharmaceuticals have sanctions from the government. Nutraceuticals may range from isolated nutrients, dietary supplements and diets to genetically engineered designer foods, herbal products and processed foods such as cereals, soups and beverages. Hippocrates emphasized "Let food be your medicine and medicine be your food" (Rajasekaran *et al.*, 2008).

Nutraceuticals create a new era of research to promote quality of life. They can reduce the risk of disease onset by retaining normal health condition and improving immunity. As food is not only the source of energy and nutrients but also provides medicinal benefits and nutritional therapy is based on complimentary therapy with nutraceuticals. Large numbers of people are dependent on natural and alternative medicines in India due to imbalance in the diet and nutritional deficiencies. Nutraceuticals are now available as capsules, tablets or powders in a prescribed dose. Some popular nutraceuticals include green tea, glucosamine, lutein,

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ginseng, echinacea, folic acid, cod liver oil ,dry ginger, aloevera, flax seeds,etc.

Advantages of Nutraceuticals:

From the consumer's point of view nutraceuticals offer many benefits. Some are given below :

1. Nutraceuticals play an important role in healthy eating and contributes in prevention and treatment of diseases .
2. Enables consumers to derive daily dose of vitamins and minerals .
3. They are less toxic.
4. Cost effective and are easily available.
5. Increase the health value of our diet.
6. Help us live longer.

Nutraceuticals are categorized based on foods available in the market:

Traditional nutraceuticals:

Traditional nutraceuticals are simply natural with no changes to the food. Food contains several natural components that deliver benefits beyond basic nutrition, such as lycopene in tomatoes, omega-3 fatty acids in salmon, or saponins in soy. They are grouped based on-

Chemical Constituents:

Nutrients: The nutrients include amino acids, fatty acids, minerals and vitamins with recognized nutritional functions. Most foods contain vitamins that aid in curing diseases like stroke, cataracts, osteoporosis and heart diseases. Minerals found in plants, animals and dairy products are useful in osteoporosis, anemia and in building strong bones, teeth, muscles, and improve nerve impulses and heart rhythm. Foods that contain fatty acids like omega-3 PUFAs are potent regulators of the inflammatory processes, maintenance of brain function and reduction in cholesterol deposition**.**

Herbals: Herbal nutraceuticals help to improve health and avert chronic diseases. Most of these are analgesic, anti-inflammatory, astringent, antipyretic and antiarthritic. Some of the herbals contain flavonoids like apiol, psoralen that are diuretic, carminative and antipyretic. Peppermint contains menthol as an active component that help cure cold and flu. Some of the plants contain tannin which is claimed to aid in the management of depression, cold, stress, cough, hypertension and asthma while proanthocyanadin found in some herbals are useful in the treatment or prevention of cancer, ulcers and urinary tract infections (Chauhan *et al.,* 2013).

Phytochemicals: Phytochemicals are plant nutrients with particular biological activities that promote human health. They are also referred to as Phytonutrients. They work by serving as substrate for biochemical reactions, O. K. Nwosu and K. I. Ubaoji 17 cofactors or inhibitors of enzymatic reactions, absorbents that bind to and eradicate unwanted constituent in the intestine and improve the absorption and/or stability of indispensable nutrients among others (Zhao, 2007).

Probiotic Microorganisms*:*

Probiotics mean 'for life'. They are defined as live microorganisms, which when consumed in tolerable amounts, confer a health effect on the host (Michail *et al.*, 2006). These microorganisms are responsive bacteria that promote healthy digestion and absorption of some nutrients. They most importantly act to mob out pathogens, like yeasts and other bacteria and viruses that may cause disease and develop a communally advantageous symbiosis with the human gastrointestinal tract (Holzapfel *et al.,* 2001).

Nutraceutical Enzymes*:*

These are enzymes that are derived from plant, animal and microbial sources. Enzymes are an essential part of life, without which our bodies would cease to function optimally. Medical conditions such as blood sugar disorders, digestive problems and obesity have their symptoms eliminated by enzyme supplements in the diet.

Non-traditional nutraceuticals:

Non-traditional nutraceuticals are artificial foods prepared with the help of biotechnology. Food samples contain bioactive components which are engineered to produce products for human- wellness. They are arranged into:

Fortified nutraceuticals*:*

These are nutraceuticals from agrarian breeding or added nutrients and/or ingredients. Examples include cereals with added vitamins or minerals, milk fortified with cholecalciferol used in vitamin D deficiency, flour with added folic acid, prebiotic and probiotic fortified milk with Bifidobacteriumlactis HN019 used in diarrhea, respiratory infections and severe illnesses, in children

(Sazawal *et al.*, 2010), and orange juice fortified with calcium.

***Recombinant nutraceuticals**:*

Recombinant Nutraceuticals Recombinant nutraceuticals include the making of probiotics and the extraction of bioactive components by enzyme/ fermentation technologies as well as genetic engineering technology. Also, energy-providing foods, such as bread, alcohol, fermented starch, yoghurt, cheese, vinegar, and others are produced using modern biotechnology. Examples include cows with lactoferrin.

Other nutraceuticals:

Dietary supplements:

Dietary supplements are products envisioned to complement the diet that accepts or contains one or more of the following dietary ingredients: a mineral, a vitamin, an amino acid, a herb or other botanical, constituent, metabolite, a dietary substance for use by man to supplement the diet by increasing the total daily intake, or a concentrate, extract, or combinations of these ingredients (Zeisel, 1999). Dietary supplements are not intended to treat or remedy disease whereas nutraceuticals emphasize more on the expected results of these products, such as prevention or treatment of diseases. One of the best example of nutraceutical which is used as a dietary supplements are flax seeds.

Flaxseed encompasses the potential health suiting nutritional profile in it. However, many people are still unaware of the potential health benefits of flaxseed and food applications. Flaxseeds are the richest source of á-linolenic acid and lignans. It is also a considerable potential source of soluble fiber, antioxidants and high quality protein. The role of flaxseed lignans and ù-3 fatty acid in reducing the risks associated with cardiac and coronary disease, diabetes, cancer (breast, colon, ovary and prostate) and other human health risk factors has been well known. General recommendation for daily intake has been 1–3 table spoons per day for ground flaxseed.There is no doubt that a change to an omega-3 rich and high fiber diet would be beneficial. Therefore the use of flaxseed in whole seed or ground form can be recommended as a dietary supplement.

Functional food:

Functional food as defined by the united states of america institute of medicine's food and nutrition board, functional food is "any food or food ingredient that may offer a health benefit beyond the traditional nutrients it contains". The functional food concept is – "Food products to be taken as part of the usual diet in order to have helpful effects that go beyond basic nutritional function". Functional foods contain physiologically active components obtained either from plants or animal sources (Ernst, 2001).

Herbals:

Herbs play a significant role in the maintenance of the quality of human life through the abundant source of bio-constituents. The herbal bioactive constituents are an essential category of nutraceuticals which have plenty of health promoting medicinal properties in addition to minerals, vitamins and other active compounds. The herbs harbor a widespread variety of active phytochemicals like flavonoids, terpenoids, saponin, and polyphenols. These herbal bioactives are most times commonly used by people who seek conventional health care as a food supplement.

Role of nutraceuticals in diabetes:

Diabetes mellitus is characterised by abnormally high levels of blood glucose, either due to insufficient insulin production, or due to its ineffectiveness. The most common forms of diabetes are type-1 diabetes (5%), an autoimmune disorder and type-2 diabetes (95%), which is associated with obesity. Gestational diabetes occurs in pregnancy (American Diabetes Association, 2011).

In diabetic patients, Omega-3-fatty acids are suggested to reduce glucose tolerance and promote insulin sensitivity. Insulin is required for the synthesis of long chain n-3 fatty acids, which contain ethyl esters that may be potentially beneficial in diabetic patients . A high isoflavone intake (20-100 mg/day) is associated with lower incidence and mortality rate of type 2 diabetes, heart diseases, osteoporosis and certain cancers. Docosahexaenoic acid modulates insulin resistance, especially important in women with gestational diabetes mellitus which foster the recommendation for essential fatty acids during pregnancy (Thomas *et al.,* 2019).

Lipoic acid is a universal antioxidant, may be more effective as a long-term dietary supplement aimed at the prophylactic protection of diabetic patients from complications. Dietary fibres from psyllium help in weight reduction, glucose control in diabetic patients and to reduce lipid levels in hyperlipidaemia (Coleman *et al.,*

2001).

As we know that diabetes has become one of the most common concerns of the medical world today. The metabolic disorder currently afflicts millions of people across the globe. According to a study, published in the Lancet, by the year 2030, about 98 million Indians are at a risk of being diagnosed with diabetes. We also know that diabetes is a condition where blood glucose levels are abnormally high or erratic. While there is no cure to reverse diabetes, but there are enough natural ways with the help of which people could manage the symptoms.Diet is a crucial component of diabetes management.

As per a latest study, plant-based diet may work wonders to reduce diabetes symptoms and even stave off risk of developing the condition. It is a good idea to supplement a diabetic diet with enough leafy greens, lentils and legumes, additionally some healthy nuts and seeds like flax seeds may also include in daily diabetic diet. These nutraceuticals are said to have incredible benefits for diabetes patients.

Conclusion:

Among many disease or disorders of carbohydrate, fat and protein metabolism, diabetes is a serious disorder effecting large population of the world. It is associated with decreased insulin production or resistance towards its action. Plants have been traditionally used to treat diabetes patients, both insulin dependent and non-insulin dependent diabetes. Nutraceuticals are food supplements and have nutritional value.Some nutrients are discussed in this article have exhibited significant clinical & pharmacological activity. The potency of herbal drugs is significant and they have negligible side effects than the synthetic anti-diabetic drugs. There is increasing demand by patients to use the natural products with anti-diabetic activity. The efficacy of hypoglycaemic herbs is achieved by increasing insulin secretion, enhancing glucose uptake by adipose and muscle tissues, inhibiting glucose absorption from intestine and inhibiting glucose production from hepatocytes. With a little bit of careful handling, the future of both plant and animal origin nutraceuticals holds exciting opportunities in the medical field.

Last but not least,from this paper I have concluded that-

- Non pharmacological treatment is the first line therapy for diabetes. Several nutraceuticals have been shown to positively influence blood glucose with negligible side effects.
- Among different nutraceuticals substances, effects of flax seeds appear the most convincing for diabetes.
- Nutraceutical agents have multidimensional therapeutic benefits and have been claimed to have effective disease preventing, curative and health promotive virtues.

REFERENCES

American Diabetes Association (2011). Diagnosis and classification of diabetes mellitus. *Diabetes Care*; **1** : 62-69.

Chauhan, B., Kumar, G., Kalam, N. and Ansari, S.H. (2013) Current concepts and prospects of herbal nutraceutical: a review. *J. Adv. Pharm. Technol. Res.*, **4**(1):4-8

Coleman, M.D., Eason, R.C. and Bailey, C.J. (2001). The therapeutic use of lipoic acid in diabetes: a current perspective. *Environ. Toxicol. Pharmacol.,* **10**(4) : 167-172.

Ernst, E. (2001) Functional foods, nutraceuticals, designer foods: innocent fad or counterproductive marketing ploy. Eur. J. Clin. Pharmacol., **57** : 353–355.

Holzapfel, W.H., Haberer, P., Geisen, R., Bjorkroth, J. and Schillinger, U. (2001). Taxonomy and important features of probiotic microorganisms in food and nutrition. Am. J. Clin. Nutr., **73** : 365S–373S

Lakshmana, P.S., Suriya, P.T.N.K., Dinesh, K.C., Suresh, K.S. and Ragavendran, T. (2012). Nutraceuticals: A Review. *Elixir Pharmacy*, **46** : 8372-8377.

Michail, S., Sylvester, F., Fuchs, G. and Issenma, R. (2006). Clinical efficacy of probiotics: Review of the evidence with focus on children, clinical practice guideline. J. Pediatr. Gastroenterol. Nutr., **43**(4)

Rajasekaran, A., Sivagnanam, G. and Xavier, R. (2008). Nutraceuticals as therapeutic agents: A Review. *Research J. Pharm. & Tech*., **1**(4):328-340.

Sazawal, S., Dhingra, U., Hiremath, G., Sarkar, A., Dhingra, P., Dutta, A., Verma, P., Menon, V.P. and Black, R.E. (2010). Prebiotic and probiotic fortified milk in prevention of morbidities among children: community-based, randomized, double-blind, controlled trial. *PLoS One,* **5**:e12164

Thomas, B., Ghebremeskel, K., Lowy, C., Crawford, M. and Offley-Shore, B. Nutrient intake of women IAJPS (2019), 06 (11), 14421-14427 Gera Jemimah et al ISSN 2349-7750 w w w . i a j p s . c o m Page 14427 with and without gestational diabetes with a specific focus on fatty acids.

Nutrition, 2006; 22(3):230-236.

Zeisel, S.H. (1999). Regulation of "Nutraceuticals". *Science,* **285**:185–186

Zhao, J. (2007). Nutraceuticals, nutritional therapy, phytonutrients, and phytotherapy for improvement of human health: a perspective on plant biotechnology application. Bentham Science Publishers. Available from: http://www.benthamscience.com/biot/samples/biot1-1/Zhao.pdf. Last accessed 03 April, 2019.

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