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Anti diabetic activity on home remedies

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ABSTRACT

Diabetes is a very common disease or disorder of metabolism. It is a complex group of diseases triggered by various causes. People with diabetes have high blood glucose, also known as high blood sugar or hyperglycemia. The digestive tract breaks down carbohydrates or sugar and starches found in many foods into glucose, a form of sugar that enters the bloodstream. With the help of the hormone insulin the bodies absorbs glucose and utilizes it for producing energy. Diabetes develops when the body is unable to produce enough insulin or use insulin effectively. Insulin is made in the pancreas, an organ located behind the stomach. The Pancreas contains clusters of cells called islets; the beta cells within the islets make insulin and release it to the blood. If the beta cells don't produce enough insulin or the body is unable to respond to insulin that is present, the glucose builds up in the blood instead of being absorbed by the cells in the body, leading to prediabetes or diabetes. Prediabetes is a condition in which the blood glucose levels or A1C levels are higher than normal, but not high enough to be diagnosed as diabetes. In diabetes the body cells lack enough energy, even though the glucose levels are very high. The increase in the blood sugar levels damages nerves and blood vessels. It also leads to complications like cardiovascular diseases, strokes, kidney problems, blindness, dental problems and amputations. High blood glucose levels also damage nerves and blood vessels.

Keywords: Diabetes, Hyperglycaemia, Cardiovascular diseases, Strokes.

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder resulting from a defect in insulin secretion, insulin action, or both. Insulin deficiency in turn leads to chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism. As the disease progresses tissue or vascular damage ensues leading to severe diabetic complications such as retinopathy, neuropathy, nephropathy, cardiovascular complications and ulceration. Thus,

diabetes covers a wide range of heterogeneous diseases. Diabetes is the most common endocrine disorder and by the year 2010, it is estimated that more than 200 million people worldwide will have DM and 300 million will subsequently have the disease by 2025. The diagnostic criteria and the classification of diabetes was first put forward by the World Health Organization (WHO) in 1965 then by the National Diabetes Data Group (NDDG) in 1979, and this was followed by simplified

recommendations by the WHO in 1980.20 These WHO recommendations were modified slightly in 1985. The latest recommendations have been published by the American Diabetes Association (ADA) in 1997 and by the WHO in 1999. Both groups agree on the recommendations and criteria. According to the ADA recommendation changes in 1997, the fasting glucose concentration should be used in routine screening for diabetes as well as epidemiological studies; the threshold for fasting glucose was changed from 7.8 mmol/L (140 mg/dl) to 7.0 mmol/L (126 mg/dl); however the 2-h glucose criterion remains as = 11.1 mmol/L (200 mg/dL). For the diagnosis of diabetes, at least one criteria must apply:

- Symptoms of diabetes (polyurea, polydipsia, unexplained weight loss, etc) as well as casual plasma glucose concentration = 11.1 mmol/L (200 mg/dL).
- Fasting plasma glucose = 7.0 mmol/L (126 mg/dL), with no caloric intake for at least 8 h.

The WHO diagnosis and classification of diabetes mellitus (1999) are identical to those of ADA, a fasting glucose = 7.0 mmol/L (126 mg/dl) and /or a 2-h glucose = 11.1 mmol/L (200 mg/dL). The report states that diagnosis should not be based on a single glucose determination but requires confirmatory symptoms or blood/plasma determination. Ideally, therefore, both the 2-h and fasting value should be used. These recommendations contrast with those of ADA Expert Committee which gives primacy to the 'fasting plasma glucose.' The WHO classification includes both clinical stages (normoglycaemia, impaired glucose tolerance/impaired fasting glucose (IGT/IFG), diabetes) and aetiological types of diabetes mellitus, identical to the ADA except that WHO group includes classification formerly known as gestational impaired glucose tolerance (GIGT) and GDM: fasting glucose = 7.0 mmol/L (126 mg/dL) and/or 2-h glucose = 7.8 mmol/L (140 mg/dL) after a 75-g OGTT.

Diabetes mellitus may be categorized into several types but the two major types are type 1 and type 2. On the basis of aetiology, the term type 1 and type 2 were widely used to describe IDDM and NIDDM, respectively; other specific types of diabetes and gestational diabetes are given in Table 1. The term juvenile -onset diabetes has sometimes been used for IDDM and maturity-onset for NIDDM. On the basis of etiology, type 1 is present in patients who have little or no endogenous insulin

secretory capacity and who therefore require insulin therapy for survival. The two main forms of clinical type 1 diabetes are type 1a (about 90% of type 1 cases in Europe) which is thought to be due to immunological destruction of pancreatic β cells resulting in insulin deficiency; and type 1b (idiopathic, about 10% of type 1 diabetes), in which there is no evidence of autoimmunity. Type 1a is characterized by the presence of islet cell antibody (ICA), anti-glutamic acid decarboxylate (anti-GAD), IA-2 or insulin antibodies that identify the autoimmune process with β -cell destruction. Autoimmune diseases such as Grave's disease, Hashimoto's thyroiditis and Addison's disease may be associated with type 1 diabetes mellitus. There is no known etiological basis for type 1b diabetes mellitus. Some of these patients have permanent insulinopaenia and are prone to ketoacidosis, but have no evidence of autoimmunity. This form is more prevalent among individuals of African and Asian Origin.

Type 2 diabetes is the commonest form of diabetes and is characterized by disorders of insulin secretion and insulin resistance. In Western countries the disease affects up to 7% of the population. Globally, it affects 5-7% of the world's population. This prevalence is underestimated because many cases, perhaps 50% in some population, remain undiagnosed. The prevalence of type 2 diabetes varies considerably throughout the world, ranging from <1% in certain population of the developing countries for example rural Melanesians in Papua New Guinea, and rural Chinese, to over 50% in the Pima Indians of Arizona. There is a higher incidence of type 2 diabetes in urban than in rural areas. Its incidence is associated with population whose lifestyle has changed from traditional patterns to a modern "Westernized" model. The classical example includes the Pima Indians, Chinese who moved to Mauritius and Japanese who emigrated to Hawaii. Traditionally, type 2 diabetes is common in individuals over the age of 40. It is often associated with obesity, decreased physical activity and heredity. Recent data from several countries show that type 2 diabetes is increasingly becoming a problem among adolescents and even children. In some countries, childhood diabetes type 2 is more common than type 1. The disease is usually controlled through dietary therapy, exercise and hypoglycaemic agents.

Gestational Diabetes (GD) mellitus refers to the onset or initial recognition of glucose intolerance during pregnancy, usually in the second or third trimester. It occurs in about 4% of all pregnancies. Patients with GD have a 30% to 50% chance of developing DM, usually type 2 DM. Other types include genetic defects of the pancreatic β cell or in insulin action pathways (insulin receptor mutations or post-receptor defects) as well as disease of the exocrine pancreas (e.g., Pancreatitis, pancreatic reaction, or cystic fibrosis) are less common causes of DM. Endocrinopathies producing insulin counterregulatory hormones excess (e.g., Cushing's syndrome, acromegaly) may result in DM. Certain drugs like glucocorticoids, pentamidine, niacin, and α -interferon may also lead to DM. Among several monogenic forms of DM which have been identified, maturity-onset diabetes of the young (MODY) is a familial form of NIDDM with autosomal-dominant inheritance, which usually develops in childhood, adolescence or young adulthood, and presents primarily insulin-secretion defects. MODY is not a single entity, but involves genetic, metabolic, and clinical heterogeneity. Mutations in six genes cause most cases of MODY (MODY1 - MODY 6). The prevalence of MODY is unknown but about 2-5% of patients with type 2 diabetes may in fact have MODY.

Symptoms

Symptoms are similar in both types of diabetes but they vary in their intensity. Symptoms develop more rapidly in type 1 diabetes and more typical. The symptoms include polyuria, polydipsia, polyphagia, weight loss, fatigue, cramps, constipation, blurred vision, and candidiasis.

Fenugreek



Longstanding type 1 DM patients are susceptible to microvascular complications; and macrovascular disease (coronary artery, heart, and peripheral vascular diseases).

Symptoms in type 2 DM are similar but insidious in onset. Most cases are diagnosed because of complications or incidentally. Type 2 DM carries a high risk of large vessel atherosclerosis commonly associated with hypertension, hyperlipidaemia and obesity. Most patients with type 2 diabetes die from cardiovascular complications and endstage renal disease. Geographical differences exist in both the magnitude of these problems and their relative contributions to overall morbidity and mortality.

Prevention

Insulin replacement therapy is the mainstay of treatment in patient with type 1 diabetes while type 2 diabetes should be regarded as a potentially preventable disease. A study done in Australia Aborigines demonstrated marked improvement in carbohydrate and lipid metabolism in patients with type 2 DM who reverted to a traditional lifestyle. An important large-scale prospective study in China, examined the effects of diet and exercise upon the rate of progression of IGT to diabetes; both the measures, alone or together reduced the progression of the disease by 40% after 6 years. Similar studies done in Sweden also demonstrate the effectiveness of life-style changes in preventing diabetes. More recently, the Finnish Diabetes Prevention Study showed that lifestyle intervention reduced by 58% the risk of subjects with IGT progressing to type 2 diabetes.

Trigonella foenum-graecum, commonly known as Methi, is an annual plant that has many uses, both culinary and medicinal.

Family: Fabaceae

The plant is cultivated worldwide as a semi-arid crop, and is a common ingredient in dishes from the Indian subcontinent. The seeds of this plant contain an alkaloid trigonelline and another compound

known as choline. These seeds have been reported to be diuretic, anti-tussive and hypoglycaemic in nature. 4-hydroxyisoleucine, a novel amino acid from fenugreek seeds also increased glucose-stimulated insulin release by isolated islet cells in both rats and humans. Fenugreek seeds are used as an adjuvant in the control of type 2 diabetes mellitus [1].

Karela



Momordica charantia, often called as karela, bitter melon, bitter gourd, or bitter melon is a tropical and subtropical vine.

Family: Cucurbitaceae

It is widely grown in Asia, Africa, and the Caribbean for its edible fruit, which is among the most bitter of all fruits. Bitter melon originated in the Indian subcontinent, and was carried to China in the 14th century. The fruit contains at least three active substances with anti-diabetic properties, including charantin, which has been confirmed to have a blood glucose-lowering effect, vicine, and an insulin-like compound known as polypeptide-p.

These substances either work individually or together to help reduce blood sugar levels. It is also known that bitter melon contains a lectin that reduces blood glucose concentrations by acting on peripheral tissues and suppressing appetite—similar to the effects of insulin in the brain. This lectin is thought to be a major factor behind the hypoglycemic effect that develops after eating bitter melon. Bitter melon has been used to treat diabetes in traditional medicine and is now commercially available as tea [from fruits or leaves], juice, extracts, and pills [2].

Neem



Azadirachta indica is also known as Neem.

Family: Meliaceae

It is native to India, Pakistan, and Bangladesh, growing in tropical and semi-tropical regions. Neem leaves are dried in India, Pakistan, and placed in cupboards to prevent insects from eating the clothes

and also while storing rice in tins. Neem leaves are dried and burnt to keep away mosquitoes. It is considered a major component in Ayurvedic and Unani medicine and is particularly prescribed for skin diseases. Neem oil is used for preparing cosmetics such as soap, neem shampoo, balms, and

creams as well as toothpaste. Products made from neem trees have been used in india for over two millennia for their medicinal properties: Neem products are belivede to be anthelemintic. antifungal,antidiabetic,antibaceterial,antiviral,conra

ceptives and sedatives. Hypoglycaemic effect was obseved with Azadirachta indica when given as a leaf extracts and seed oil in normal as well as diabetic rabbits [3].

Cinnamon



Cinnamon is a spice obtained from inner bark of several tree from genus cinnamomum that is used in both sweet and savory foods.

Family: Cinnamomum Verum

Cinnamon is used in yraditional medicine,and several studies have tested chemicals extracted

from cinnamon for various possible medicinal effects.Cinnamon has been proposed for use as an insect repellent,althought it remains untested. Few studies claim that cinnamon will reduce serum glucose,triglyceride,LDL cholesterol,and total cholesterol in people with type 2 diabetes [4].

Amla



Phyllanthus emblica[syn.Emblica officinalis],commonly known as indian gooseberry or amla is a deciduous tree.It is known for its edible fruits of the same name.

Family: Phyllanthaceae

Indian gooseberry has undergone preliminary research,demonstrating in vitro antiviral and antimicrobial properties.It mqy prove to have potential activity against some cancers. Amla has been an anti-diabetic quality.It helps in restoring viqmin C in diabetic patients and improves

metabolism with all its health benefits it helps in controlling blood sugar level. Research studies show that polyphenol-rich fruit actually has properties that can procet body from the oxidative properties of high blood sugar.the same compound is also effective in preventing insulin resistance caused due to high fructose diet.This means that fruit can actually assist in proper absorption of insulin ading to drop in blood sugar in diabetics [5].

Jamun



Syzygium cumini also known as jamun or black plum, is an evergreen tropical tree in the flowering plant.

Family: Myrtaceae.

Jamun is native to India, Bangladesh, Nepal, Pakistan, Sri Lanka, the Philippines, and Indonesia. It is an important medicinal plant in various traditional systems of medicine. The plant is rich in compounds containing anthocyanins, glucoside, ellagic acid, isoquercetin, Kaempferol and myricetin. It is effective in treatment of diabetics

mellitus, inflammations, ulcers and diarrhea and preclinical studies have also shown it to possess chemoprotective, radioprotective and antineoplastic properties. The plant was extensively studied during the last 125 years; approximately 100 case reports were reported already before the discovery of insulin. The seeds are claimed to contain alkaloid, jambosine, and glycoside jambolin or antimellin, which halts the diastatic conversion of starch into sugar [6].

7. Aloe vera



Aloe vera is a succulent plant probably originated in northern Africa.

Family: Xanthorrhoeaceae.

Aloe vera is frequently cited as being used in herbal medicine since the beginning of the first century AD. Aloe vera extracts are widely used in the cosmetics and alternative medicine industries, being

marketed for having rejuvenating, healing or soothing properties. Aloe vera can be used for lowering blood glucose and blood lipid level in diabetic and cardiac patients, says a study report prepared by the scientists of Banaras Hindu University [BHU] [7].

8. Turmeric



Curcuma longa, commonly known as turmeric is a rhizomatous herbaceous perennial plant native to tropical south asia and needs temperatures between 20 c and 30c and a considerable amount of annual rainfall to thrive.

Family: Zingiberaceae.

Phytochemicals found in turmeric have been investigated in preliminary research for their potential effects on diseases such as

cancer, Alzheimers disease, arthritis, diabetes and other clinical disorders. as an examples of such basic research, turmeric reduced the severity of pancreatitis-associated lung injury in mice.

Curcumin, a principal curcuminoid found in turmeric, intervention of a prediabetes population significantly lowered the number of prediabetic individuals who eventually developed T2DM [8].

9. Garlic



Garlic is scientifically known as *allium sativum*.

Family: Amaryllidaceae

Garlic is being used for more than 7,000 years. Garlic is native to central asia. Garlic was known to ancient Egyptians, and had been used for both culinary and medicinal purposes.

Garlic is alleged to help regulate blood sugar levels has been shown to prevent some complications of diabetics mellitus. Regular and prolong use of therapeutic amount aged garlic extracts lower blood homocysteine levels. It is believed that people taking insulin should not consume medicinal amounta of garlic without consulting a physician [9].

10. Ginger



Zingiber officinale, commonly known as ginger or ginger root is the thick knotted underground stem [rhizome] of the plant that has been used for centuries in Asian cuisine and medicine.

Family: Zingiberaceae

Ginger cultivation began in south Asian and has since spread to east Africa and the Caribbean. Fresh ginger is one of the main spices used for making pulse and lentil curries and other vegetable preparations. It is consumed as a

delicacy, medicine, or spice. Fresh as well as dried, ginger is used to spice tea and coffee, especially in winter. Ginger is particularly useful in treating chronic inflammation because it partially inhibits two important enzymes that play a role in inflammation gone awry—cyclooxygenase [COX] and 5-lipoxygenase [LOX]. Ginger supplementation improved insulin sensitivity and some fractions of lipid profile in type 2 diabetes patients [10].

11. Flax seed oil



Flaxseed oil also known as linseed oil, is a colourless to yellowish oil obtained from the dried ripe seeds of the flax plant [*linum usitatissimum*].

Family: Linaceae

Due to its high levels of alpha linolenic acid [a particular form of omega-3 fatty acid], it is used as a nutritional supplement. Flaxseed is considered healthy due to the fact that they contain omega-3 fatty acids, lignans, rich in antioxidants and

fiber. The fiber in flaxseed is found primarily in the seed coat. Taken before a meal, flaxseed fiber seems to make people feel less hungry, so that they might eat less food. Researchers believe this fiber with cholesterol in the intestine and prevent it from being absorbed. Flaxseed oil may also lessen the severity of diabetes by stabilizing blood sugar levels [11].

12 curry leaves



Murraya koenigii commonly known as curry leaves are used in many dishes in india and neighboring countries.

Family: Rutaceae

The curry tree is a tropical to sub-tropical tree which is native to india and sri lanka. A carbazole

alkaloid isolated from this plant ,found that it inhibited the growth and induced apoptosis in human hepatocellular carcinoma,hepG2 cells in vitro.These leaves of murraya koenigii as a herb in ayurvedic medicine.they are belived to possess anti-diabetic properties [12].

13. Ivy gourd



Ivy gourd also known as baby watermelon,little gourd,gentlemen's toes,tendli etc.It is a tropical vine.It is scientifically known as *coccinia indica*.

Family: Cucurbitaceae

In southeast asia, ivy gourd is grown for its edible young shoots and edible fruits It is used in traditional medicine to treat leprosy,fever,asthma,bronchitis and jaundice.The

fruit possesses mast cell stabilizing anti-anaphylactic and antihistaminic potential. Compounds in the plant inhibit the enzymes glucose-6-phosphates-one of the key liver enzymes involved in regulating sugar metabolism. There ivy gourd is arguably recommended for diabetic patients [13].

14. Green tea



Green tea is made from leaves from *Camellia sinensis* that have undergone minimal oxidation during processing.

Family: Theaceae

Green tea is originated from China, but it has become associated with many cultures throughout Asia. Over the last few decades green tea has subjected to many scientific and medicinal studies to determine the extent of its long-purported health benefits, with some evidence suggesting that the regular green tea drinkers may have a lower risk of developing the heart diseases and certain types of cancer. Flavonoids, is one of the major constituent

in green tea has anti oxidative and anti carcinogenic functions. A certain type of flavonoids called gallated catechins found in green tea has been shown to inhibit the enzyme amylase produced and secreted by the salivary glands and pancreas for digestion of starches. This slows the rate in which the sugar contained in starches is metabolized and released into the bloodstream. It is believed that green tea is not a cure for diabetes but a natural gift for resorting balance in the human system and removing unwanted toxins accumulated from the internalizing of the environment [14].

15. Isabgol



Psyllium seed husk is also known as isabgol, isabgol, psyllium

Family: Plantaginaceae

It is portion of the seeds of the plant *Plantago ovata* a native of India fiber. They are used to relieve constipation, irritable bowel syndrome and diarrhea. Some recent research is also showing

them to be promising in lowering cholesterol and controlling diabetes. The U.S Food and Drug Administration [FDA] has established a tangible benefit of psyllium seed husk intake and a decreased risk of coronary heart disease [CHD]. Psyllium's soluble fiber thus has the potential to decrease the risk of CHD [15].

16 Ashwagandha



Withania somnifera is commonly known as Ashwagandha. It is also known as Indian ginseng, poison gooseberry or winter cherry.

Family: Solanaceae or nightshade

Ashwagandha is cultivated in many of the drier regions of India like Madhya Pradesh, Punjab, Sindh, Gujarat and Rajasthan.

It is used as a herb in ayurvedic medicine. Ashwagandha may help normalize high

blood sugar and improve insulin sensitivity [16].

17. Wheat grass



Wheatgrass is a food prepared from the cotyledons of the common wheat plant, *Triticum aestivum*.

Family: Poaceae

It is sold either as a juice or powder concentrate. It provides chlorophyll, amino acids, minerals, vitamins and enzymes. Wheat grass

is claimed to be superior to other vegetables in its content of vitamin b12, a vital nutrient. Inclusion of the wheatgrass in various food recipes resulted in a significant decrease in glycemic index in human subjects [17].

18. Almonds



Prunus amygdalus commonly known as almond is a species of tree native to the middle east and south asia

Family: Rosaceae

Almond is often eaten on its own, raw or toasted. It is also a component of various dishes. In india almonds are the base ingredients of pasanda-style curries. Badam halva is a sweet made from almonds with added coloring. Almond flakes are added to many sweets [such as sohan barfi] and

are usually visible sticking to the outer surface. Almonds are rich source of vitamin E, containing 26mg per 100g. preliminary research associates consumption of almonds with elevating blood levels of high density lipo proteins and lowering low density lipo proteins. Few animal studies have shown benefits in diabetes. No clinical data is available in terms of use in diabetes among human. [18].

19 Olive oil



Olive oil is a fat obtained from the olive [the fruit of *Olea europaea*]

Family: Oleaceae

It is a traditional tree crop of the mediterranean basin. The oil is produced by pressing whole olives. It is commonly used in cooking, cosmetics, pharmaceuticals and soaps. Olive oil has a longer history of being used as a home remedy for skincare. Egyptians used it alongside beeswax as a cleanser, moisturizer and

antibacterial agent since pharaonic times. Preliminary clinical studies provide evidence that consumption of olive oil may lower risk of heart disease risk factors such as lower blood cholesterol levels and reduced LDL cholesterol oxidation and that it may also possibly influence inflammation, thrombotic, hypertensive and vasodilator mechanisms. It is also known to reduce blood glucose level in type 2 diabetics [19].

20. Gurmar



Gymnema sylvestris commonly known as cowplant or gur-mar [in India] is a herb native to the tropical forests of southern and central India and Sri Lanka.

Family: Asclepiadaceae

Gurmar reduces the taste of sugar when it is placed in the mouth. From extracts of the leaves, glycosides known as gymnemic acids

which exhibit anti-sweet activity. *G. sylvestris* has been used in herbal medicine as a treatment for diabetes for nearly two millennia. The active ingredients are thought to be the family of compounds related to gymnemic acid and purified gymnemic acids have anti-diabetic effects [20].

21 Pomegranate juice



Punica granatum commonly known as pomegranate is a fruit bearing deciduous shrub or small tree

Family: Lythraceae

It is widely cultivated throughout the Mediterranean region of southern Europe the middle east and Caucasus region ,northern Africa and tropical Africa,the indian subcontinent and the drier parts of southeast asia. Pomegranates are used in cooking ,baking,juices,smoothies and alcoholic beverages such as martinis and wine. Few animal studies have shown benefits in diabetes.Clinical trails are underway as per the registry of clinical

trials. A study conducted in Israel has revealed that pomegranate juice could provide some health benefits for diabetics.It is actually surprising news.because the juice is known to contain significant amounts of sugar. The surprising revelation was made that the sugars found in pomegranate juice,although similar in property to other fruit juice sugars are attached to unique anti oxidants,did not negatively influence diabetes parameters.the juice was even found to lower the risk of atherosclerosis [21].

22 Ginseng



Ginseng [*panax quinquefolius* L] is slow growing perennial plants with fleshy roots

Family: Araliaceae ,Genus: *Panax*

Ginseng is found only in the northern hemisphere in north America and in eastern asia [mostly hemisphere in north America and in eastern asia [mostly korea northeastern china,Bhutan and eastern Siberia],typically in cooler climates. The root is most often available in dried form,either

whole or sliced.Ginseng may be included in small doses in energy drinks. Ginseng remains under preliminary research for its potential properties or therapeutics effects such as for respiratory illnesses quality of life,influenza or fatigue in cancer patients. American ginseng is useful in diabetes for reduction of blood glucose,body weigh,and important psychophysical performance [22].

23 Apple cider vinegar



Apple cider vinegar is a type of vinegar made from apple. Apple cider vinegar is used in salad dressings, food preservatives, chutneys among other things.

It is made by crushing apples and squeezing out the liquid. Bacteria and yeast are added to the liquid to start the alcohol is converted into vinegar by acetic acid forming bacteria [aceto bacter]. Acetic acid and malic acid give vinegar its sour taste. The biologically active constituent of vinegar is acetic

acid which inhibits the activity of several carbohydrates digesting enzymes, including amylase, sucrose, maltase and lactase. As a result when vinegar is present in the intestines some sugars and starches temporarily pass through without being digested so they have less of an impact on blood sugar. Several small studies have found that vinegar may help in lowering glucose levels [23].

24 Spirulina Algae



Spirulina is a cyanobacterium that can be consumed by humans and animals and is made primarily from two species of cyanobacteria. *Arthrospira plantensis* and *arthrospira maxima*

Family: Phormidiaceae

Arthrospira is cultivated worldwide used as a dietary supplement as well as a whole food; and is available in tablet, flake and powder form. It is also used as a feed supplement. In humans small studies

have been undertaken evaluating spirulina in undernourished children as a treatment for the cosmetic aspects of arsenic poisoning in hay fever and allergic rhinitis. Animal studies have evaluated spirulina in the prevention of chemotherapy induced heart damage, stroke recovery, age related declines in memory, diabetes mellitus, in amyotrophic lateral sclerosis [24].

25 Noni fruit



Morinda citrifolia is a tree in the coffee family bearing the fruits commonly called as Noni fruit, morinda, indian mulberry and cheese fruit

Family: Rubiaceae

Its native range extends through southeast asia and Australasia and the species is now cultivated throughout the tropics and widely naturalized. The green fruit, leaves and root/rhizomes were

traditionally used in Polynesian cultures to treat menstrual cramps, bowel irregularities, liver diseases and urinary tract infections. It contains linoleic acid possibly useful when applied topically to skin`eg : for anti inflammation, acne reduction or moisture retention. The fruit is also known to have anti-diabetic properties [25].

26 Bilva leaves



Aegle marmelos commonly known as Bael, bangal quince, stone apple, is a species of tree native to india

Family: Rutaceae

The fruit is eaten fresh or dried. If fresh, the juice is strained and sweetened to make a drink similar to lemonade. It can be made into sharbat. Research has

found the essential oil of the bael tree to be effective against 21 types of bacteria .It is prescribed for smooth bowel movement to patients suffering from constipation and other gastrointestinal problems. The potential hypoglycemic nature of the leaf extract helps in regeneration of damaged pancreas [26].

27 Tender mango leaves



The mango is a fleshy stone fruit belonging to the genus *Mangifera*, consisting of numerous tropical fruiting trees in the flowering plant

Family: Anacardiaceae

The mango is native to South Asia, from where it has been distributed worldwide to become one of the most cultivated fruits in the tropics. *Mangifera indica* – the common mango or Indian mango is the only mango tree commonly cultivated in many tropical and subtropical regions. Ripe mango fruit is

considered to be invigorating and freshening. The juice is restorative tonic and used in heat stroke. The seeds are used in asthma and as an astringent. Fumes from the burning leaves are inhaled for relief from hiccups and affections of the throat. The bark is astringent; it is used in diphtheria and rheumatism and it is believed to possess a tonic action on the mucous membrane. Few animal studies on extracts of mango leaves have reported a beneficial role in diabetes [27].

28 Vinca Rosea



Catharanthus roseus commonly known as the Madagascar periwinkle, Cape periwinkle, rose periwinkle, rosy periwinkle and old-maid.

Family: Apocynaceae

The species has long been cultivated for herbal medicine and as an ornamental plant. The

substances vinblastine and vincristine extracted from the plant are used in the treatment of leukemia and Hodgkin's lymphoma. In Ayurvedic the extracts of its roots and shoots, though poisonous, is used against several diseases, including diabetes, malaria and Hodgkin's lymphoma [28].

29 Agati Flower



Sesbania grandiflora commonly known as August flower, agate or hummingbird tree

Family: Fabaceae

Indigenous from Malaysia to North Australia, cultivated in many parts of India

It contains arginine, cysteine, histidine, isoleucine, phenylalanine, tryptophan, valine, threonine, alanine, aspartic acid, oleanolic acid, galactose, rhamnose and glucuronic acid.

Leaves are used as tonic, diuretics, laxatives, antipyretic, chewed to disinfect mouth and throat. Flower in headache, dimness of vision. Bark is used for cooling [ayurvedha and siddha medicinal terms], bitter tonic, anthelmintic, febrifuge, diarrhea, small

pox, astringent. Fruit in bitter and acrid, laxative, fever, pain, bronchitis, anemia, tumors, colic, jaundice, poisoning. Root used in rheumatism, expectorant, painful swelling. Few animal studies have claimed to show benefits in diabetes [29].

30 White button Mushroom



Agaricus bisporus commonly known as white button mushroom

Family : Agaricaceae

It is native to grasslands of Europe and north America. Cultivated in more than 70 countries and is one of the most commonly and widely consumed mushrooms in the world. Edible mushrooms and their constitutive active compounds have been described to have beneficial effects on hyperglycemia and hypercholesterolemia. White button mushroom has high content of acidic

polysaccharides, dietary fiber and anti oxidants, including vitamins C, B12 and D, folic acid, ergothioneine, and polyphenol suggesting that the mushroom may have potential anti inflammatory, hypoglycemic and hypocholesterolemic effects. The table mushroom has also been shown to possess possible immune system enhancing properties. An *in vitro* study demonstrated the mushroom enhanced dendritic cell function [30].

31 Drum stick leaves



Moringa oleifera commonly known as drum stick is the most widely cultivated in India

Family : Moringaceae

It may be used as forage for livestock, a micronutrient liquid, a natural anthelmintic and possible adjuvant. Moringa has been used in folk medicine, including siddha medicine and ayurvedic

traditional medicine. In ayurvedic traditional medicine the leaves are believed to affect blood pressure and glucose levels. Moringa is undergoing preliminary research to reveal potential antibacterial effects *in vitro*, improved glucose tolerance in rat model of diabetes [31].

32 Onion



Allium cepa also known as the bulb onion or common onion is used as a vegetable and is the most widely cultivated species of the genus allium

Family : Amaryllidaceae

It is believed that onion contain phenolics and flavonoids tha have potential anti-inflammatory,anti-cholesterol,anti cancer and anti oxidant properties. Onion is used for treating digestion problem including loss of appetite,upset

stomach,and gallbladder disorder for treating heart and blood vessel problems including chest pain [angina] and high blood pressure,and for preventing “hardening of the arteries” [atherosclerosis]. It is also used for treating sore mouth and throat,whooping cough,bronchitis,asthama,dehydration,intestinal gas,parasitic worms and diabetes.Some people use it as a diuretic to increase urine output [32].

33 Ragi



Eleusine coracana [ragi/finger millet] is an annual plant widely plant grown as a cereal in the arid area of Africa and asia

Family : Poaceae

It is very adaptable to higher elevations and in grown in the Himalaya up to 2,300 meters in

elevation.Eleusine coracana is often intercropped with legumes such as peanuts or other plants such as niger seeds. Finger milled is especially valuable as it contain the amino acid methionine. Very few animal data is available regarding its use in diabetes [33].

34 Brahmi



Centella asiatica commonly centella [brahmi] is small herbaceous annual plant of the family

mackinlayaceae or subfamily mackinlayoideae of family apiaceae and is native to india

It is used as a medicinal herb in ayurvedic medicine, traditional African medicine and traditional Chinese medicine. Centella is a mild anti bacterial, anti viral, anti inflammatory, antiulcerogenic, anxiolytic, nervine and vulnerary and can act as a cerebral tonic a

circulatory stimulant and a diuretic. Few reports show the medicinal properties of *C. asiatica* extracts in a wide range of disease conditions such as diabetic microangiopathy, edema, venous hypertension [34].

35 Tulsi



Ocimum sanctum or *ocimum tenuiflorum* is also known as holy basil, tulsi or tulasi

Family: Lamiaceae

It is an aromatic plant which is native throughout the eastern world tropics and widespread as a cultivated plant. It is cultivated for religious and medicinal purposes and for its essential oil. It is widely known as across South Asia as a medicinal plant and an herbal tea commonly

used in Ayurveda. Traditional tulsi is taken in many forms as herbal tea, dried powder, fresh leaves or mixed with ghee. Essential oil extracted from tulsi is mostly used for medicinal purposes and in herbal cosmetics and is widely used in skin preparations.

Ocimum sanctum leaf extracts stimulate insulin secretion from perfused pancreas, isolated islets and clonal pancreatic beta cells [35].

36 Bermuda grass



Cynodon dactylon [syn. *panicum dactylon*, *capriole dactylon*] is also known as durva grass, dhoob, Bermuda grass, Indian doab

Family: Poaceae

It is a grass native to north and east Africa, Australia and southern Europe. It is fast growing and tough, making it popular and useful for sports fields as when damaged it will recover quickly. It is a highly desirable turf grass in warm temperature climates, particularly for those regions

where its heat and drought tolerance enable it to survive where few other grasses do. *Cynodon dactylon* protein fraction promotes immune modulation. The grass is known to improve digestion and stomach ailments helps in increasing red blood cells in the body. It is also an effective home remedy against skin rashes, itching etc. Few animal studies have shown that aqueous extracts of *Cynodon dactylon* has antidiabetic potential along with significant hypoglycemic effects [36].

37 Guava fruit



Psidium guajava commonly known as Guava is a green shrub or small tree widely cultivated in tropical and subtropical regions around the world

The leaves contain flavonol morin ,morin-3-oxylxoside,morin 3-o-arabinoside,quercetin and quercetin-3-o-arabinoside. It is used not only as food but also as folk medicine in subtropical areas around the world because of its pharmacological activities. In particular the leaf extracts of guava has traditionally been used for the treatment of diabetes

in east asia and other countries. Few animal,human studies haveshown benefits in diabetes. In japan,guava leaf tea containing the aqueous leaf extract from guava has been approved as one of the foods for specified health uses and is now commercially available. However little is known regarding the therapeutics activity of the extract in human clinical trails as well as its underlying therapeutic mechanisms and safety [37].

38 Banana sana/flower



A banana is an edible fruit produced by several kinds of large herbaceous flowering plants of the genus *Musa*

Family: Musaceae

Banana flower's extracts is found to stabilize blood sugar levels,which may help those suffering from diabetes. The high antioxidant content of

banana flowers prevent oxidation and inhibits molecules from destabilizing DNA. This prevent heart diseases and strokes. Bananana are as excellent source of vitamin B6 ,soluble fiber,and contain moderate amounts of vitamin C,managanese and potassium.Few animal studies have shown its benefits in diabetes treatment [38].

39 Custard Apple leaf



Annona squamosa a small well branched tree or shrub that bear edible fruits also called as custard apple

Family; Annonaceae

Annona squamosa has been shown to possess wide range of biological activities such as anti-lipidemic, anti-tumor, anti-microbial, antithyroidal and antidiabetic activity. There is a claim that some tribal population in parts of northern india that

young leaves of the custard apple tree, *Annona squamosa* has antidiabetic properties. The exact mechanism of antidiabetic action needs further studies, but the present investigation gives some preliminary idea that the water extract from leaves of *A. Squamosa* acts at more than one site, namely pancreas [release of hormone insulin] muscle and intestine [uptake of glucose through specific receptor] [39].

40 Cutch Tree



Acacia Arabica [gum Arabica tree] commonly known as babbul is a species of acacia native to Africa, the middle east and the Indian subcontinent

Family ; Fabaceae

It is found all over India mainly in the wild habitat. The plant extract acts as an antidiabetic agent by acting as secretagogue to release insulin. It

induces hypoglycemia in control rats but not in alloxanized animals. Powdered seeds of *Acacia Arabica* when administered [2, 3 and 4 g/kg body weight] to normal rabbits induced hypoglycemic effect by initiating release of insulin from pancreatic beta cells [40].

41 Devil's cotton



Abroma augustum also known as devil's cotton is a species of *abroma*

Family: Malvaceae

It is dark red flowers with a characteristic and usually appearance. It is widely distributed in Asia. It is a medicinal plant with wide variety of reported uses, including as an abortifacient and for treating uterine disorders, rheumatic joint pain, headache

with sinusitis, dysmenorrhea, ghematic joint pain, headaches with sinusitis, dysmenorrhea, gonorrhoea, stomach ache, diabetes and dermatitis. The antidiabetic activity of aqueous extract of dried root bark of *abroma augusta* L. has been observed in diabetic rat [41].

42 Indian liquorice



Known as jequirity Indian liquorice is a slender, perennial climber that twines around trees, shrubs and hedges

Family : Fabaceae

It is a legume with long, pinnate-leafleted leaves. The plant is best known for its seeds, which are used as beads and in percussion instruments and which are toxic due to the presence of abrin. The seeds of are much valued in native jewelry for their

bright coloration. Most beans are black and red, suggesting a ladybug. In Siddha medicine the white variety is used to prepare oil that is claimed to be an aphrodisiac. A tea is made from the leaves and used to treat fevers, coughs and colds. Seeds are poisonous and therefore are used after mitigation. The plant is also used in Ayurveda. Trigoneline [TG] Seed is known to have anti-diabetic property [42].

43 Fever Nut



Caesalpinia commonly known as fever nut is a genus of flowering plants

Legume family- Fabaceae

Membership within the genus is controversial, with different publications including anywhere from 70 to 165 species, depending largely on the inclusion or exclusion of species alternately

listed under genera such as *Hoffmannseggia*. Some species are grown for their ornamental flowers. Brazil wood [*C. echinata*] is the source of a historically important dye called brazilin and of the wood for violin bows. Animal studies have shown that extract of *caesalpinia* has antidiabetic effect [43].

44 King of bitter



Andrographis paniculata is native to India and Sri Lanka, also called as Nees, King of Bitters, Chirayeta, and Kalmegh.

Family : Acanthaceae

It is used to treat infection, often being used before antibiotics were created. Mostly the leaves and roots were used for medicinal purposes. The plant extract exhibits antityphoid and antifungal activities. Kalmegh is also reported to possess antihepatotoxic,

antibiotic, antimalarial, antihepatitic, antithrombotic, anti-inflammatory, anti snake venom, and antipyretic properties to mention a few besides its general use as an immunostimulant agent. The aerial part of the plant used medicinally contains a large number of chemical constituents, mainly lactones, diterpenoids, diterpene glycosides, flavonoids, and flavonoid glycosides. Animal studies have shown that the extract of *Andrographis paniculata* possesses antidiabetic activity [44].

45 Prickly pear cactus



Opuntia littoralis is also called as Prickly pear cactus, nopales, or paddle cactus.

Family : Cactaceae

Prickly pears typically grow with flat, rounded cladodes [also called platyclades] that are armed with two kinds of spines; large, smooth, fixed spines and small, hairlike prickles called glochids, that easily penetrate skin and detach from the

plant. Many types of prickly pears grow into dense, tangled structures. Some species of *Opuntia* have been investigated in preliminary research. One study on *O. megacantha* raised concern about toxic effects on the kidney, and extracts of *O. streptacantha* may inhibit alpha-glucosidase activity. Thus, it may be considered as anti-diabetic [45].

46 Neelabadari



Neelabadari commonly known as Bilberry, is one of the several species of low growing shrubs bearing edible berries

Family : Ericaceae, Genus : Vaccinium

Bilberries are distinct from blueberries but closely related to them. Blueberries or bilberries contain large amounts of anthocyanins, making them one of the richest source of dietary anthocyanin. Studies in rats have provided preliminary evidence that bilberry consumption

may inhibit or reverse eye disorders such as macular degeneration. Few animal studies have shown benefits in diabetes. No clinical data is available in terms of use in diabetes among human. Traditionally bilberry leaves have been used to control blood sugar levels in people with diabetes. Research shows that all berries help reduce the body's glucose response after eating a high sugar meal. Studies suggest bilberry is not recommended to help manage diabetes [46].

47 Avaram



Senna auriculata [*cassia auriculata*] is a legume tree in the subfamily caesalpinioideae. It is commonly known as avaram seena

Family : Fabaceae

It occurs in the dry regions of India and Sri Lanka. It is common along the sea coast and the dry zone in Sri Lanka. This plant is said to contain a

cardiac glycoside [sennapicrin] and sap. Leaves and bark yield anthraquinones, while the latter contains tannins. The root is used in decoctions against fever, diabetes, diseases of urinary system and constipation. The leaves have laxative properties [47].

48 Musk Mallow



Abelmoschu moschatus [abelmosk, ambrette seeds, annual hibiscus] is an aromatic and medicinal plant native to India

Family : Malvaceae

It has many culinary uses. The seeds are added to coffee; unripe pods [“musk okra”], leaves and new shoots are eaten as vegetables. Different parts of the plant have uses in Ayurveda herbal medicine. Ambrette seeds have traditionally been used to treat

a wide variety of ailments and are also used in cosmetics and food. The roots and leaves are sometimes cultivated for medicinal or industrial purposes. The oil from the seeds is used worldwide in perfumes and to flavor food. The scented oil was often described as woody and floral, similar to musk, an animal. Early evidence suggests that a substance in ambrette may help regulate sugar levels [48].

49 Green Plantain peel



The unripe fruit of banana fruit is called as green plantain

Family: Musaceae

Green plantain has low GI carbohydrates, and is high in dietary fibre, iron, vitamins and minerals. Additionally, plantain contains a small amount of serotonin which has the ability to dilate the arteries and improve blood circulation. Green plantain peels- Washed then put in a jar with water, covered overnight, then drinking this three times a day claims to lower blood sugar level [49].

CONCLUSION

This study is a first survey giving an initial overview on use of home remedies from patients' perspective in society bearing in mind the indicated high use of home remedies for symptom management of minor health complaints.

It is highly likely that general practitioners (Gp's) may need to advise on the use of home remedies in consultations. Nevertheless, many of the Indian Gp's are practicing and promoting the

Paleo diet plans and health benefits to avoid diabetes mellitus in all the age groups. There is anecdotal evidence on the use of home remedies. Based on personal experiences and recommendations, however Gp's need access to reliable information concerning health risks and benefits.

There are also benefits to be gained in terms of supporting patients to take an active role in their health, when Gp's are able to provide advice on the use of home remedies and incorporate possible home remedies into symptom management plans for minor health complaints as many patients state they desire.

Nevertheless, it can't be ignored that there is a significant gap in the body of medical knowledge on the subject of home remedies and although it reflects the low importance that has been placed on this subject to date, given the amount of indicated use by patients and regional difference, further scientific research in this area needs to be conducted.

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