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An Overview of Anti-Diabetic Application and Role of Indian Medicinal Plant

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Abstract: ***Multiple forms of herbal drugs have been invented and applying for the management of diabetes in whole world however results remained inconclusive. The single target approach is insufficient to make up the therapeutic approach of disease and its complications. Herbal drugs remain the preferable choice for the management and treatment of disease, antidiuretic property considered efficient component in many developing countries. In this review we have explore the clinical and experimental literature on harb-durg interaction and treatment of diabetes. Among the research on medicinal plant only a few have been evaluated as per contemporary system of medicine. From many such plants only extracts have been prepared for their usefulness evaluation in experimental diabetes in animals. In some plants like Allium cepa, Allium sativum, Ficus bengalensis, Gymnema sylvestre, Pterocarpus marsupium etc. active hypoglycemic principles have been isolated and their mechanism of action studied. For the deterrence of various chronic diseases and its difficulty, yet a single target approach has not been clarified.***

Keywords: Diabetes, Herbal drugs, Gymnema sylvestre, Allium cepa, Pterocarpus marsupium

I. INTRODUCTION

Diabetes mellitus is a complex chronic illness characterised by hyperglycaemia, eventually leads to insult multiple organs system. There are two type of diabetes T1DM & T2DM, T1DM commonly referred to insulin dependent diabetes mellitus (IDDM) linked with the impaired insulin production while T2DM cells in unable to response of insulin (insulin resistance), so called non-insulin dependent diabetes mellitus.(NIDDM)[1].

The prevalence of diabetes enhancing globally, in 2015 assessed 415 million people with diabetes, this number estimated to enhance 642 million by 2014. [2] more than 70% people with T2DM residing in the developing countries, this proportion getting wider annually. [3] Change in lifestyle exclusively suggests that's physical exercise, diet and other non-pharmacological intervention may delay or prevent the progression of T2DM.

However, acquiesce to these interference in very less, only 50% of such chronic disease patients have been considered the significance of the life style intervention.[4] the various antidiabetic drugs has shown positive effect but the increasing number of patient showing, more effective, safer and cost effective approach awaited.

Complementary and Alternative Medicine (CAM) considered the substitution for the management of diabetes and proportion rapidly increasing over the last decade. It is published that up to 72.8% of the people with diabetes applying herbal medicine, various type of alternative medicine, nutritional supplement and other CAM therapy. [5] Overall research based on, the CAM therapy in place of the conventional medicine. [6]

A wide range of herbal plants believed to carrying antidiuretic properties and have been applying to manage the various stage of diabetes.[7-9] however the contemporarily applying antidiabetic plant and pharmaceutical medicine, in context of safety for the health care. Unlike pharmaceutical drugs, where all the component are characterised appropriately while in the herbal medicine carrying multiple biological active compound lack of understanding the interaction or mechanism of action and which combination is appropriate.

Although, number of studies linked with herb-drug interaction underlined positive or negative impact, unveiled the interactions of the herbal drugs action in the context of antidiabetic manifestation.

Positive outcome between the herbs and drugs may lead to accelerating effectiveness of the antidiabetic agent through additive or synergistic action.

The aim of this review is to exploring the various studies of the interaction between the antidiabetic drugs and conventional medicine.

II. THE ACTION OF HERB-DRUG INTERACTION

There are several plant products remedies suggested for diabetic complications. Herbal plants form the main ingredients of these formulations. Following plants play a vital role in the management of diabetes.

A. Acacia arabica: (Babhul)

Acacia Arabica ubiquitously occurs in Indian subcontinent, extracted compound act as an antidiabetic properties, acting as secrtagouge to release insulin. Extracted compound shown hypoglycaemia in control rats but remain inconclusive over the alloxanized animals. While powder form of seed administration (2,3 and 4 g/Kg body weight) to the normal rabbit performed hypoglycaemia by the moderate action of insulin release from pancreatic beta cells.[18]

B. Aegle Marmelos: (Bengal Quince, Bel or Bilva)

The aqueous Bengal Quince leaves extract administration remarkably improve digestion, decrease blood sugar and urea level, have been evaluated on the allozanised rats as compared to control. Including exhibition of hypoglycaemic activities this component also prevented rising peak of blood glucose score at 1h with OGTT (Oral Glucose Tolerance Test.)

C. Allium cepa: (onion)

Various soluble fractions of ether and insoluble fractions of dried onions make a remarkably hyperglycemic dress in diabetic rabbits. Allium cepa is considered a model of antioxidant and hypolipidemic activity. The administration of sulfur-containing amino acids from Allium cepa, S-methyl cysteine sulfoxide (SMCS) (200 mg / kg for 45 days) to diabetic rats induced by alloxan effectively reduce blood glucose and lipids in serum and tissues and regularize performance hepatic hexocinase, glucose 6-phosphatase and HMG Co A reductase [20,21]. When patients with diabetes had a single oral dose of 50 g of onion juice, they organized post-prandial glucose levels in a targeted manner [22].

D. Allium sativum: (garlic)

It's a multi-year culture that grows all over India. Allicin, an unstable compound with sulfur, responsible for the odor of freshly chopped garlic, plays an important role in controlling the blood sugar level [21]. It is believed that the effect is due to increased liver digestion, increased insulin output from the pancreas beta cells and / or insulin sensitivity [22]. Aqueous solution is the same solution of garlic (10 mg / kg / day) orally administered to sucrose (10 g / kg / day in water for two months), increasing levels of liver glycogen and amino acids Free, which reduces the level of blood sugar and triglyceride found in serum, contrasts with sugar monitoring [25]. The active ingredient of S-allyl (sodium) sulfoxide cysteine garlic, the precursor of allicin and garlic butter, shows hypoglycemic agents that are effectively associated with stimulation of insulin production or dietary assimilation of antioxidants. Sugar, a key feature of the amino acids, the clear peroxide fat is better than glibenclamide and insulin. It also improves the condition of diabetics. The bags also handle the effect of insulin in a vitro-free, pancreas botanical cell derived from normal mice [37]. Allium sativum, including allergic reactions and heart-protective actions.

E. Aloe Vera And Aloe Barbadensis

Aloe vera is a popular succulent plant with evergreen perennial species, grow in tropical region around the world, having Multipurpose healing propensity.

The utility of herbs encompass into two basic forms: gel and latex. Gel part of Aloe vera is the leaf pulp or mucilage while aloe latex, derived from the inner lining of yellow exudate just beneath the outer skin of the leaves. Derived part of aloe gum efficiently enhance glucose tolerance in both normal and diabetic rats.

Therapeutic significance of exudates of Aloe barbadensis leaves observed in the management of blood glucose level in alloxanized diabetic rats. Single as well as chronic doses of bitter principle considered appropriate for the improvement of hypoglycemic effect in diabetic rats. Such wider action of Aloe vera and its bitter principle construct efficient stimulation of synthesis and/or release of insulin from beta cells of pancreas.[27] This plant also has possess the tendency of anti-inflammatory activity in a dose dependent manner and recovers wound healing in diabetic mice [28].

F. Azadirachta Indica: (Neem)

Hydroalcoholic extracts of Azadirachta indica exhibited an efficient tendency of blood glucose management in streptozotocin treated rats as well as enhance the glucose intake and glycogen storage in isolated rat hemidiaphragm [30,31]. Not only have they shown anti-diabetic activity but also had anti-bacterial, antimalarial, antifertility, hepatoprotective and antioxidant effects [32].

G. Caesalpinia Bonducella

Caesalpinia bonducella is a most common plant frequently occurs in the coastal region of India and used ethnically by the tribal people residing in this region for controlling glycaemic level. Both the aqueous and ethanolic extracts exhibited potent hypoglycemic architecure in chronic T2DM models. These extracts also enhance glycogenesis mechanism in thereby rising liver glycogen content [32]. The experimental mechanism based on two fractions BM 169 and BM 170 B could enhance the secretion of insulin from isolated pancreatic islets. The 50% ethanolic extracts and aqueous solution of Caesalpinia bonducella seeds addressed antihyperglycemic and hypolipidemic activities in streptozotocin (STZ)-diabetic rats [33]. It is considered that the may be blocking of glucose absorption tendency resulting of antihyperglycemic action. Wider healing tendency showed by Caesalpinia bonducella seed extract including antidiabetic as well as antihyperlipidemic activity [34].

H. Capparis Decidua

Capparis decidua occurs in dry area especially throughout India, most potent hypoglycemic effect was observed in alloxanized rats, while the rats were uptake fruit powder 30% extracts of Capparis decidua (C.decidua) for 3 weeks. This extract also decreased alloxan induced lipid peroxidation pointedly in erythrocytes, kidney and heart. C. decidua action was analysed to modulating superoxide dismutase and catalase enzyme levels to decreasing oxidative stress [36]. In addition C. decidua also possess hypolipidaemic activity tendency [37].

I. Eugenia Jambolana: (Indian Gooseberry, Jamun)

In India famous household vegetable remedy decoction of kernels of Eugenia jambolana is frequently applied for diabetic patients. This also indicating an appropriate constituent of herbal formulations for diabetes incidence. The aqueous and alcoholic extract of Eugenia jambolana play Antihyperglycemic role as well as lyophilized powder performs decreasing of blood glucose level. This differs with different level of diabetes status. In mild diabetes (plasma sugar >180 mg/dl) it performs 73.51%, decreasing, while in moderate (plasma sugar >280 mg/dl) and severe diabetes (plasma sugar >400 mg/dl) it is fall down to 55.62% and 17.72% respectively [38]. The e jamun pulp extract presented the hypoglycemic effect in streptozotocin induced diabetic mice within 30min uptake while the same fruit seeds required 24h. The characteristic of oral administration of the extract showed in increase in serum insulin levels in diabetic rats. Pancreatic insulin secretion was observed to be stimulated plant extract incubation with isolated islets of Langerhans from diabetic animals as well as normal. These extracts also characteristics of inhibition in liver and kidney insulinase activities. [39].

J. Mangifera Indica: (Mango)

Quoted from Mangifera indicator leaves are used as antidiabetic agents in traditional Nigeria, although when the aqueous solution, orally administration does not change the level of blood sugar in the normal glycemic or the streptozotocin mouse. However, the properties were observed when antidiabetic and simultaneous quoting led sugar were administered to the mouse 60 minutes before glucose. The results suggest that the aqueous solution of the activity maintains Mangifera hypoglycemic. This is probably because of the reduction in glucose intake in the intestine [39].

K. Momordica Charantia: (Bitter Gourd)

It is often used as an antidiabetic and antihyperglycaemic agent in the Indian continent, as well as in other Asian nations. Harvesting products of whole fruits, whole leaves and whole plants are studied for the effectiveness of sugar in many species. Polypeptide obtained from M Fruit. Seeds, seeds and tissues have the effect of lowering blood sugar when being treated in the veins and in humans. Ethanol salt of M. charantia (200 mg / kg) works against the toxins and hypoglycemia in normal mice and STZ diabetes. This may be due to the suppression of glucose-6-phosphatase, including fructose-1,6-bisphosphatase in the liver and stimulation of the liver function of glucose-6-phosphate dehydrogenase [41].

L. Ocimum Sanctum: (Holy Basil)

It is considered holy as the name of Tulsi. The plant is well known for its healing value. This is an aqueous solution of leaves of the sanctum Ocimum, which significantly represents the reduction of agents for blood sugar levels, both in normal mice and alloksan diabetic [42]. Significant reduction in blood sugar intake, uronic acid, a common amino acids, total cholesterol and total cholesterol triglycerides, hypoglycemic effects and reveals hypoplastic osmistata sacredness in mice, urine Sweet [43]. Oral administration of the plant extract (200 milligrams per kg) for 30 days reduces plasma levels to nearly 9.06 and% sugar, respectively, at 26.4 to 15 and 30 days of study. Kidney glycogen increased 10 times, while muscle and liver glycogen levels were reduced by 68% in mice

and 75 compared to diabetes mellitus [44]. The plant also demonstrates antiastimitichno plant, anti-stress, anti-bacteria, fungi, antiviral, anti-tumor, anti-ulcer activity, antioxidant, antimutagenic and immunostimulant activity.

M. Trigonella Foenum Graecum: (Fenugreek)

Everywhere in India, fenugreek seeds are full. Often given as one of the main ingredients of Indian spice. 4-hidroksilevtsin, a new amino acids from the seeds of fenugreek, which are characterized by the addition of sugar-insulin secretions driven by far-off islets of Langerhans cells and in mice and humans [42]. Oral vaccines from 2 to 8 grams per kilogram Produce a plant component contributes to the reduction of normal sugar levels, and both in the mouse, diabetes, in the administration of fenugreek seeds, and increasing glucose digestion and activity. Of the kinase creatine in the heart, the muscles, the bones and the liver in the mouse, diabetes. It reduces the effects of the liver and kidney-6-phosphatase and fructose-1, 6-bisphosphatase [46]. The plant also has antioxidant properties [47].

III.CONCLUSIONS

The plants are natural antioxidants and herbal medicines effective, partly because of their antidiabetic compounds, such as flavonoids, tannins, phenolics and alkaloids that improve the performance of pancreatic tissues by increasing the secretion of insulin or decreasing intestinal glucose uptake. Further research is needed to separate the active plant components and molecular interactions of their compounds for the analysis of their healing properties.

The List of Following Indian Medicinal Plants And Its Family, Observation

S.No		Plant	Family	Observation	Ref.
1		Acacia Arabica (Babhul)	Fabaceae	Powder seed of Acacia Arabica significantly managed glycaemic state in the STZ induced diabetic rat.	18
2		Allium cepa: (onion)	Amaryllidaceae	In the site of Liver: compete with insulin for insulin inactivating, crude allium cepa show meaningful results in T1DM & T2DM management.	20,21
3		Allium sativum: (garlic)	Amaryllidaceae	streptozotocin-induced diabetic rats showed exclusively reduced blood glucose level.	22,37
4		Aloe vera and Aloe barbadensis (Gheekumari)	Asphodelaceae	Additive effect on glycaemic level fall down	28
5		Caesalpinia bonducella (Fever nut)	Caesalpiniaceae	STZ diabetic rat showed antihyper glycemic and hypolipidemic activities.	32,33 ,34
6		Eugenia jambolana (Indian gooseberry, jamun)	Myrtaceae	Antihyperglycemic effect of aqueous and alcoholic extract as well as lyophilized powder reduced blood glucose level.	38
7		Mangifera indica (Mango)	Anacardiaceae	aqueous extract of Mangifera indica showed hypoglycemic activity	39
8		Momordica charantia (bitter gourd)	Cucurbitaceae	Fruit pulp, seed, leaves and whole plant was shown hypoglycemic effect by Infusion of subcutaneously in langurs and humans	41
9		Ocimum sanctum: (holy basil)	Lamiaceae	Aqueous extract of leaves of Ocimum sanctum shown significantly reduction of blood glucose level in both normal and alloxan induced diabetic rats	42,43 ,44

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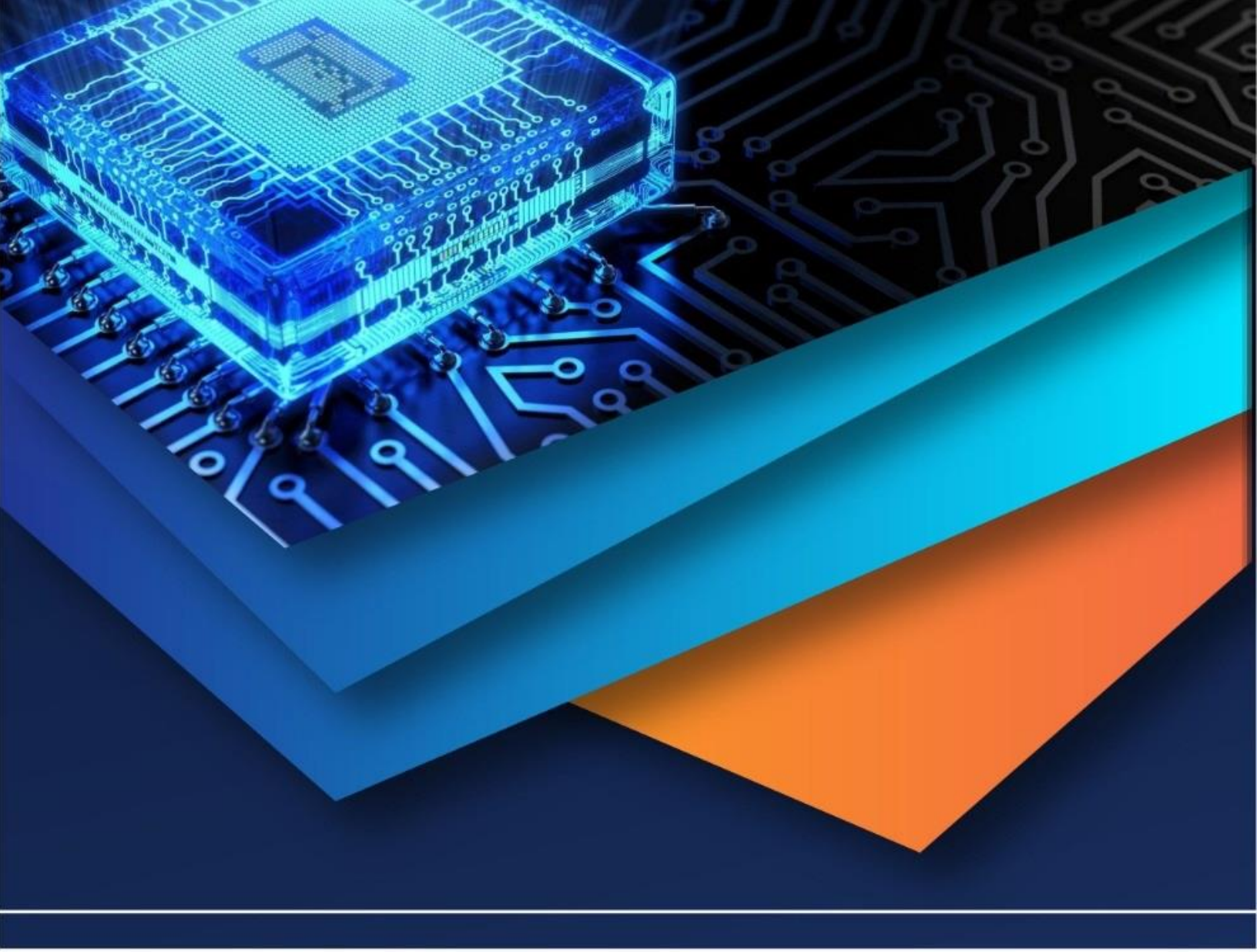

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