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Review: Adjuvant Treatment and Herbal Therapy of Garlic and Jackfruit on Diabetes

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Abstract: Diabetes mellitus, the disorder of carbohydrate metabolism characterized by the impaired ability of the body to produce or to respond to insulin and thereby maintain the proper level of sugar (glucose) in the blood is obligatory. Overview of a survey of diabetes stated that 53 deaths per 100000 happened cause of diabetes mellitus and in India, Tamilnadu had the highest death rate from this disorder. Some adverse reactions shown by chemical drugs on the individual, to neglect them the current era of pharmacy and biotech field highly focused on herbal and adjuvant treatment. Herbal therapy is a fulcrum of complementary and alternative medicine, which in recent generations highly gaining widespread popularity all over the world. The herbal drugs like Garlic and Jackfruit which are readily available and having cost-efficient property are mostly preferable and showing impressive results. Other aspect stated about the importance of effective diet plan which having endowment to reduce blood sugar level in the victim. These therapies significantly reveal the negligible side effects on an individual.

Keywords: Diabetes, Adjuvant, hypoglycemia, agranulocytosis, leucopenia

I. INTRODUCTION

An estimated 425 million people had diabetes worldwide up to 2017, 90% of patients are affected by type 2 diabetes. Both women and men are suffered equally and 8.8% of the adult population is suffered by this disorder. Diabetes is a metabolic disorder characterized by an increase in sugar levels over a prolonged period. Diabetes is caused because of either the lack of insulin which is secreted by the pancreas, or the body cells which are not responding properly to the insulin produced. Diabetes mellitus is classified into four wide categories. They are type 1, type 2, gestational diabetes, and other specific types ^[1]. Other rare forms of diabetes mellitus are those due to specific genetic disorders like maturity-onset diabetes of young's (MODY) other endocrine disorders. (Increase in plasma glucose greater than equal to 126 mg/dl. and/or greater than or equal to 200mg/dl 2 hours after 70 grams oral glucose).For the medications of diabetes oral hypoglycemic chemical drugs are used which classified in various classes. These drugs show adverse effects on patients like hypoglycemia and non-specific side effects (nausea, vomiting, constipation, flatulence, and headache) and hypersensitivity reaction (rashes, photosensitivity, purpura, transient leucopenia, rarely and agranulocytosis. Patients generally prefer herbal medicines showing negligible side effects and cost-effectiveness ^[2].

Herbal Medicines: Several extracts from the herbal plants are used as a treatment on Diabetes mellitus. It takes a longer pace to cure the disease but, it can rehabilitate the disorder. The pharmacognostic drugs which are medically active are aloe vera (aloe barbadensis), ginseng (panax ginseng), sesame oil, ginger (zingiber officinale), fenugreek (Trigonellafoenum-graecum), etc ^[3]. Dominant and remarkable herbal treatments are shown by the two herbal plants are as follows:

A. Garlic

1) Ayurvedic Description

Sanskrit name: Lasuna^[4]

Synonyms: Sitalazuna

Properties: Rasa: Snigdha (oily), tikshna (sharp), pichchila (slimy), guru (heavy),

Guna: has Pancharasa (five tastes) and lacks only lavana (salty) taste (bitter)

Virya: Ushna (hot)

Vipaka: Katu (pungent) ^[5]

Garlic (*allium sativum*) is one of the most popular herbs used in different types of cardiovascular disease. Garlic and its bioactive components are used to controlling diabetes and diabetes-associated pathologies. The pharmacological effect of garlic was reported and attributed to the presence of volatile surface compounds ^[6]. Garlic and garlic extract are effective in reducing insulin resistance. A sulfur-containing amino acid in garlic, S-allyl cysteine sulphoxide, (allicin) had the potential to reduce the severe diabetic condition ^[7].

Kingdom: Plantae
Subkingdom: Tracheobionta
Division: Magnoliophyta
Class: Liliopsida
Subclass: Liliidae
Order: Liliales
Family: Liliaceae
Genus: *Allium* L.
Species: *allium sativum*^[8]

2) Extract preparation

- a) From locally available garlic bulbs aqueous garlic extract was prepared. On crushed ice, the garlic bulbs were peeled.
 - b) Then 50 g of the peeled garlic was cut into small pieces and in 70 ml of cold, sterile 0.9% NaCl and the presence of some crushed ice homogenization took place.
 - c) At high speed using 30-second bursts for a total of 10 minutes in a blender, the homogenization was carried out.
 - d) Through cheesecloth, the homogenized mixture was filtered 3 times, the filtrate was centrifuged at 2000 RCF for 10 minutes and with normal saline, the clear supernatant was diluted to 100 ml.
 - e) Based on the weight of the starting material (50 g/100 ml), the concentration of this garlic preparation was considered to be 500 mg/ml.
 - f) An aqueous extract of garlic was stored in small aliquots at -20°C until use.
 - g) In platelet aggregation studies, the stability of the preparation during storage has been previously established.
- 3) *Pharmacology Study on Animal*: Observation and study took place on STZ induced diabetic rats in response to 500 mg/kg garlic extract administration. It is clear from the data that the garlic-treated diabetic rats showed significantly reduced serum glucose levels during the treatment period. At weeks 2, the serum glucose levels of the garlic-treated diabetic rats were reduced by 29% and in weeks 5 and 7 of garlic extract treatment the reduction of sugar were takes place up to 68% and 57%, respectively^[9].

B. Jackfruit

1) Ayurvedic description

Sanskrit name: Panasa

Synonyms: Atibrhatphala

Properties: Rasa: Madhura (sweet), kasaya (unripe fruit)

Guna: Snigdha, guru, picchila

Virya: Sita

Vipaka: Madhura^[10]

It is well known that Jackfruit is the largest tree born fruit in the world. The Jackfruit (*Artocarpus heterophyllus*) is derived from family Moraceae and it is a species of tree of the mulberry. The plant's species refers to traditional medicine in Indonesia as an anti-bacterial, antidiabetic, anti-inflammatory, antioxidant and anti-helminthics^[11]. It is found in central and eastern Africa, south-eastern Asia, Florida, Brazil, Australia and many Pacific Islands and native to Western Ghats of India, Indonesia. Several reports have cited that high proanthocyanidin and flavonoid contents from jack fruit extracts are responsible for antidiabetic effects^[12].

Kingdom: Plantae

Subkingdom: Tracheobionta

Division: Magnoliophyta plants, phanérogames

Class: Magnoliopsida

Subclass: Hamamelidae

Order: Urticales

Family: Moraceae

Genus: *Artocarpus*

Species: *Artocarpus heterophyllus* Lam^[13].

2) Extract Preparation

- a) Plucked the mature jackfruit leaves.
 - b) Washed the leaves properly by clean water.
 - c) Put one bottle of clean water along with washed leaves in a pressure cooker.
 - d) Boiled the water with leaves and wait till full ten cooker whistles blow..
 - e) Filled the boiled water in freshwater after cooling down.
 - f) Put the bottle in the refrigerator for one night for preservation ^[14].
- 3) *Pharmacology Study on Animal:* Wistar albino rats (150-200 g) were obtained for pharmacological study. The environmental condition produced were $25 \pm 1^\circ\text{C}$ temperature, with $55 \pm 5\%$ humidity with 12 hr light/dark cycle. The animals were given a standard pellet diet and pure water throughout the experimental period. On blood glucose of streptozotocin-induced diabetic rats, 21 days of treatment of extracts was carried out with positive results. It was observed that extracts of *A.heterophyllus* leaves reduce the blood glucose levels statistically and significantly ^[15].
- 4) *Pharmacology Study on Human:* The effects of hot-water extract of *Artocarpus heterophyllus* leaves on the glucose tolerance of normal human subjects and maturity-onset diabetic patients were investigated and evaluated. *Artocarpus heterophyllus* extract significantly improved glucose tolerance in the normal individual and the diabetic patients when investigated at oral doses equivalent to 20 g/kg of starting dose ^[16].

II. ADJUVANT THERAPY

The diabetes diet simply means eating the healthiest food in average amount and push to regular mealtime. For diabetes, there should be a healthful eating plan which is naturally rich in nutrients and should contain fewer amounts of fats, calories, and sugar ^[17]. Key elements are fruits, vegetables and whole grains which help the patient to control the concentration of sugar in the blood and also manage the body weight and other cardiac diseases such as high blood pressure and high blood fats. The individual can control blood glucose levels by referring to the proper diet contents and tracking the habit of eating ^[18]. Several factors are impressive effects on diabetes are noted down.

A. Carbohydrate

Over 90% of the food intake was carbohydrate. When diabetic persons were abruptly switched from their regular low-carbohydrate diet to the rice-fruit diets, no need for a change in insulin dosage was observed. A high-carbohydrate diet resulted in a minor change in peripheral insulin delivery, but a low-carbohydrate, high-fat diet reduced it considerably.

The low-carbohydrate diet resulted in only a 23% decrease in insulin delivery rate compared with the improper diet Increase of 60% in carbohydrate over that in the standard diet resulted in a large (59%) increase in insulin delivery ^[19]. The difference in insulin response to a high-carbohydrate diet was varying by sexual difference.

In women, it increased by 22.5% whereas in men it increased by only 14%. In a low-carbohydrate diet, the decrease in insulin delivery was again slightly more in men 64% as compared to women i.e. 50%. It has been suggested that diabetic persons increases the proportion of unsaturated fats and carbohydrate in the diet and reduce total fat consumption to prevent or delay the development of cardiovascular disease ^[20].

B. Sucrose

Sucrose is the composition of fructose as well as glucose having disaccharide nature. As compared to glucose, fructose shows very limited effects on diabetic patients so the involvement of fructose-rich food in the diet is favorable ^[21]. Cooked potato, rice, and bread increase the blood glucose level.

Starch is an also essential component in the diet. After starch ingestion, there were lower blood glucose concentrations compared with glucose or sucrose ingestion observed by some studies.

Starch is the form of uncooked vegetables or fruits, consistently results in lower blood glucose concentrations in both normal and diabetic subjects ^[22].

Now a day's sucrose and other refined sugars do not contain vitamins or minerals; thus, their use could lead to deficiencies of these vital nutrients. Sucrose exceeds 18% of the total food energy in the diet rarely ^[23].

The attitude of investigators and researchers strongly suggested that sugar diabetes is a disease in which "there is increasing the level of sugar in the blood." Therefore, the way you treat the disease is to "remove sugar totally from the diet ^[24]."

C. Plant fibers

It has been strongly advocated for diabetic patients to ingest a large amount of plant fiber. When diabetic subjects consume a diet high in natural plant fiber, the salutary effect on glucose excursions, insulin requirements, and blood cholesterol and triglyceride concentration has been reported [25]. Plant fibers delay gastric emptying, impair hydrolysis and absorption of carbohydrate in the small intestine, and increase bile acid excretion. They also have one impressive effect to reduce the blood cholesterol level [26]. Lack of palatability is a major problem with high-fiber diets. If a significant impact on blood glucose or blood lipids is to be obtained then, large amounts of soluble fiber are required. There are lots of adverse effects that will be possible by excess fiber concentration in diet so it should be in limit [27].

D. Body Weight

It is becoming clear that normal individuals and most obese persons, as well as diabetic persons, have a built-in mechanism for regulation of body fat mass and body weight. Depending on the needs of the individual, this mechanism regulates food intake. Thus, body weight remains stable throughout adult life in individuals in most cases [28]. Obesity is undoubtedly a major risk factor for diabetes. Considerably improve glucose tolerance in obese diabetic patients reported when the reduction in body weight takes place [29].

III. RESULTS

As per the above observations, investigations and evaluation it was reported that the herbal drugs like Garlic and Jackfruit shows significant changes in blood sugar level of healthy as well as diabetic patients. As per the above data it was resulted that the herbal drugs which studied above have properties to reduce blood glucose. Adjuvant therapy contains diet restrictions also showing symbolic effects on diabetic patients.

IV. DISCUSSION

194 million people in the whole world are affected by the most common endocrine disorder that is Diabetes mellitus. If no impressive medicine will find out to overcome this disease, up till 2025 the number will exceed 333 million (6.3% of population) [30]. With the primary effects of diabetes, diabetes is mainly responsible to increase risk factors such as dyslipidemia, hyperglycemia, hypertension, decreased fibrinolytic activity, increased platelet aggregation, and severe atherosclerosis [31]. Multifarious synthetic drug therapies have been developed for the treatment of diabetes. However, these therapies have limitations like side effects as well as efficiency. Therefore, to reduce risk factors in diabetic patients, the researchers take much interest in discovering natural therapies without toxic side effects which are injurious to human health [32]. Jackfruit and Garlic has been noted to possess exorbitant medicinal properties including hypoglycaemic, hypocholesterolaemic and hypolipidaemic activities. As per above studies on the hypoglycaemic activity of herbal drug preparations have produced variable results. We study the complete aqueous extract of the jackfruit leaves and garlic. In addition, we have observed consistent results using an aqueous extract of garlic and jackfruit leaves in Wistar albino rats. The effects of jackfruit, raw garlic were observed over a period of seven weeks as we observed. Elevation of serum glucose, cholesterol and triglyceride levels was seen in STZ-induced diabetic rats. Our results confirmed that herbal drugs have significant hypoglycaemic, hypocholesterolaemic and hypolipidaemic effects. Therefore, the present review study gives the result that garlic and jackfruit had a significant effect in reducing blood glucose level in diabetic animal models. We also observed that herbal treatment shows the significant weight loss in STZ-induced diabetic rats.

Diet regulation also shows remarkable effects in reducing the blood sugar level in diabetic individual. Carbohydrates, sucrose, plant fibers and body weight shows specified effects on diabetic victim and help to reduce the blood sugar content.

V. CONCLUSION

Considered together, all these observations further strengthen our conclusion that Herbal Therapy of Garlic and Jackfruit as well as the Adjuvant therapy is very dominant to cure Diabetes mellitus. Further, our results show that the herbal and adjuvant treatment significantly reduces the blood glucose level of the diabetic patient. Collectively, our findings indicate the emphasis and preference of herbal and adjuvant therapies.

VI. CONFLICT OF INTEREST

Conflict of interest declared none.

VII. AUTHORS CONTRIBUTION STATEMENT

Prajwal Wagh, Nikhil Mali, GouriNisha Mane and Archita Musale contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

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