Reviewing the Beneficial Effects of Amla In Diabetes

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Abstract- *Indians are believed to have greater degree of insulin resistance and stronger genetic predisposition to diabetes .* ***WHO projects*** *that diabetes will be the seventh leading cause of death in 2030 .India is capital of diabetes with 69.1 million people and is estimated to have the second highest number of cases in the world after China. Amla has low-glycemic index which means that consuming it will not increase blood sugar level. Moreover, it is rich in fiber which has the ability to absorb insulin and thus slows down the process of glucose entry in the blood. This helps in combatting the spikes in the body sugar level. The tannoids of emblica officianalis inhibits* Aldose reductase, *an* enzyme *that is normally present in many parts of the body. It catalyzes one of the steps in the* sorbitol *(*polyol*) pathway that is responsible for* fructose *formation from* glucose*. Akhtar et al,(2011) studied the effects of amla fruit on blood glucose of normal subjects and type 2 diabetes patients. The results of the study indicated a significant decrease in fasting and post prandial blood glucose and total cholesterol and triglyceride levels in both normal and type 2 diabetes patients receiving 1, 2 or 3g of amla powder per day for 21 days continuously as compared to the baseline values. Phyllanthus species was found to be involved in regeneration and rejuvenation of beta cells, thus leading to an increased insulin production and secretion. Thus exploring the therapeutic value of natural ingredients of amla, the diabetic individuals can incorporate into their diet will be an effective approach in the management of diabetes and diabetic related complications.*

I. INTRODUCTION

According to the estimates of world health organization the prevalence of Type 2 diabetes worldwide has doubled since from 108 million in 1980 to 422 million in 2014. In 2015, an estimated 1.6 million deaths were directly caused by diabetes. **WHO projects** that diabetes will be the seventh leading cause of death in 2030 .India is capital of diabetes with 69.1 million people and is estimated to have the second highest number of cases in the world after China.

Genetic susceptibility of Indians for Type 2 diabetes

Indians are believed to have greater degree of insulin resistance and stronger genetic predisposition to diabetes. They have typical phenotype with higher percentage of body fat, truncal obesity, hypertension, higher waist circumference (WC). The "metabolic load" in the individuals are generated by, high dietary glycemic load and sedentary behavior.

Role of changing food practices

With the increasing prevalence of T2DM in India, the role of changing food practices in the context of urbanisation and globalisation is a major contributor to the current diabetes epidemic. Economic advancement had also changed food availability and eating patterns. In recent decades, increasing number of meals and snacks are consumed out of the home are generally high in fat, and also commonly contain trans fats, both of which contribute to insulin resistance.

Diabetes in context to rural areas

Viswanathan Mohan M.et al., (2012) estimated that vast majority of India's population (70%) lives in rural areas. Lack of awareness due to illiteracy, lack of physicians and paramedical staff trained in diabetes, limited access to health care due to problems with transport and infrastructure, and unaffordability due to poverty are some of the major obstacles to delivering diabetes health care to rural areas.

Amla a wonder fruit for diabetes

Amla is a small to medium size tree reaching 8 – 10 m in height. The trunk is crooked with spreading branches. Leaves are oval shaped and short, the flowers are greenish yellow. The fruits are almost perfect spheres of about 1 – 1 1/2 in diameter. Amla fruits have a bitter and sour taste. Amla is a commonly used in India as fresh fruits, dried fruits, fruit pulp or extracts. Amla fruits contain one of the highest source of vitamin C in the world, **1 gr of per 100 ml of fruit juice**. It also contains minerals and amino acids such as calcium, phosphorus, iron, niacin, carotene, thiamine and riboflavin.

II. BENEFITS OF AMLA FOR DIABETIC PATIENT

- Lower the blood glucose level.
- Improve liver function.
- Increase the insulin production and secretion.
- Prevent from diabetic complications.

- Tannoids that is found in the amla are effective against Aldose Reductase inhibitors.
- Amla helps in reducing the post prandial blood glucose which delays glucose absorption and by inhibiting the carbohydrate hydrolyzing enzyme i.e. Alpha-amylase and alpha-glucosidase in the digestive organ.
- Ash of amla fruit consists of chromium, zinc and copper. Therapeutic value of chromium is effective diabetes management.

Chemical constituents of Amla

Type	Chemical constituents
Hydrolysable tannins	Emblicanin A and B 28%, Ellagitannin, Dehydroellagitannin ,
Alkaloids	Phyllantine,Phyllembein,Phyllantidine
Phenolic compounds	Gallic acid 1.32% ,methylgallate, ellagic acid, trigallayl glucose
Amino acids	Glutamic acid 29.6%, Proline14.6%,Aspartic acid, Alanine 8.1%, Cystine,Lysine 5.4%
Carbohydrates	Pectin
Vitamins	Ascorbic acid Vit C 478.56 mg / 100ml of fruit juice
Flavonoids	Quercetine , Kaempferol
Organic acids	Citric acid
Chromium	2.5 ppm

Source: Current Trends in the Research of Emblica officinalis (Amla): A Pharmacological Perspective :Swetha Dasaroju*, Krishna Mohan Gottumukkala,2014

Low glycemic index

Amla or gooseberry fruit has massive health benefits and here we will be discussing about how it combats diabetes. Amla has low-glycemic index which means that consuming it will not increase blood sugar level. Moreover, it is rich in fiber which has the ability to absorb insulin and thus slows down the process of glucose entry in the blood. This helps in combatting the spikes in the body sugar level.

Inhibitor of Aldose Reductase,

The tannoids of emblica officianalis inhibits Aldose reductase, an enzyme that is normally present in many parts of the body.It catalyzes one of the steps in the sorbitol(polyol) pathway that is responsible for fructose formation from glucose. Aldose reductase activity increases as the glucose concentration rises in diabetes in those tissues that are not insulin sensitive, which include the lenses, peripheral nerves and glomerulus. Inhibiting this enzyme is very effective in management of diabetes .

Suryanarayan et al.(2007).

Reduces the oxidative stress

Oxidative stress has been demonstrated in many studies to participate in the progression of diabetes which plays important role during diabetes, including impairment of insulin action and elevation of the complication incidence. Vitamin C, tannins and flavonoids present in amla will neutralize the elevated amount of free radicals and keep the cells protected against damage. Vitamin C is important for human beings for the synthesis of the inter-cellular cementing substance which is responsible for keeping the cells of the body together. The amla fruit is reported to contain nearly 20 times as much vitamin C as orange juice. **Prakash D et.al (2012)** analysed the free radical scavenging properties of amla, hence proved that it provide powerful antioxidant protection against the damaging free radicals, or reactive oxygen species .It works by reducing oxidative stress and impacting the hormones associated with the condition. Hence Amla is seen to be effective in controlling diabetes.

Hypolipidemic effect of amla in diabetes

Diabetes and dyslipidemia are two main factors which revolve around the pathophysiological effects of abnormal lipid levels and insulin resistance. Intake of amla extract decrease the synthesis of cholesterol by inhibiting 3-hydroxy-3-methylglutaryl-Coenzyme and elevating high-density lipoprotein level to enhance reverse cholesterol transport. Emblica officinalis contains flavonoids which reduce the levels of lipid in serum

Polyphenols abundantly present in E.officinalis fruit juice possess antihyperlipidemic activity and might exert a lipid lowering effect, which in turn may be responsible for cardioprotective effects **(Patel et al., 2011).** Amla powder showed significant antihyperlipidemic, hypolipidemic and anti atherogenic effects. All these effects may contribute to its anti atherogenic activity. Hence it was observed that lipid profile improved significantly in consumption of amla. Differences of means for HDL, LDL & VLDL were highly significant were highly significant ($p<0.001$) **(Jeevangi et al.,2013)**.

Regulation of blood sugar

Akhtar et al,(2011) studied the effects of amla fruit on blood glucose of normal subjects and type 2 diabetes patients. The results of the study indicated a significant decrease in fasting and post prandial blood glucose and total cholesterol and triglyceride levels in both normal and type 2 diabetes patients receiving 1, 2 or 3g of amla powder per day for 21 days continuously as compared to the baseline values. One of the therapeutic approaches for decreasing postprandial hyperglycemia is to prevent or delay absorption of glucose by

the inhibition of carbohydrate hydrolyzing enzymes, α-amylase and α- glucosidase, in the digestive organs.

Regeneration and Rejuvenation of beta cells

Phyllanthus species was found to be involved in regeneration and rejuvenation of beta cells, thus leading to an increased insulin production and secretion. This mechanism decreases the blood sugar levels. Evidence indicates that the aqueous extract of E. officinalis has definite hypoglycemic potential as well as anti-diabetic activity. The fruits are used in the treatment of diabetes and an infusion of the seeds are also used .

Chromium : The Master blood sugar regulator

Amla has 2.5ppm of **chromium** which has a therapeutic value in diabetes. **Chen G, Liu P, Pattar GR, et al. (2006)** in their research on molecules concluded that the presence of chromium in amla triggers the activation of a vital glucose transporter molecule called GLUT4. GLUT4 then allows glucose to flow from high concentrations in the blood to lower concentrations in the cell, allowing the cell to safely metabolize sugar while lowering sugar levels in the blood at the same time.

Prevention of diabetic complications

Exploring the therapeutic value of natural ingredients that diabetic individuals can incorporate in theirdiet will be an effective approach in the management of diabetic complications. Emblica also prevent aggregation and insolubilization of lens proteins caused by hyperglycemia **(Suryanarayan et al., 2007).** Aldose reductase plays a role in the development of secondary complication of diabetes including cataract.

III. SAFETY CONCERNS

Based on the safety assessment of the Food and Drug Administration (FDA), AMLA is considered "generally recognized as safe" (GRAS). The FDA showed that there has been well documented historical use of Amla in India and South Asia for centuries with no adverse effects. In addition, there is a massive consumption of Amla in the present day by millions of people in India and South Asia. The FDA also obtained safety corroboration from various clinical studies and animal testing on the amla extract. This is just the beginning of the journey for this magical wonder fruit of Amla and what it has to offer our world today.

IV. CONCLUSION

Inspite of the presence of number of synthetic oral antidiabetic drugs in the market, researchers are now diverted their attention to different herbs and medicinal plants in order to find out new active principle with less side effects and better antidiabetic activity**.** Further, Amla being the richest food source of Ascorbic Acid that is preserved by the presence of galleoellagi tannins, may be used as a supportive therapy for diabetes and other diseases.

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