ALTERING HYPERGLYCEMIA WITH AMLA SUPPLEMENTATION IN TYPE 2 DIABETES MELLITUS

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ABSTRACT

Introduction: Diabetes mellitus is posing a great challenge to the health of human beings in the 21st century. India is now the "diabetes capital of the world". Management of diabetes consists of use of insulin, hypoglycemic drugs, diet and lifestyle modification. Amla has an elemental role in prevention of diabetes mellitus. In India, both production and consumption of amla is high and it is used in many traditional recipes.

Objective: The purpose of conducting this study was to assess the role of Amla Extract supplementation on glycemic profile, HbA1c and haemoglobin levels of adult men and women with T2DM.

Methodology: For the present study, 90 adult men and women were purposively selected from a Diabetes Clinic as per the inclusion criteria. From these, 60 subjects comprised the experimental group and received 1 g of Amla Extract per day (capsule from) for a period of 3 months, whereas the remaining 30 subjects comprised the control group and were not given any Amla supplementation. The assessments made at baseline and after intervention were Fasting Blood Glucose (FBG) levels, Post Prandial Blood Glucose (PPBG) levels, HbA1c and haemoglobin (Hb) levels. These were assessed using an autoanalyser (enzymatic method).

Results: The mean age of men and women was 39.89± 3.71 years and 39.59 ± 3.94 years, respectively. The mean values for FBG levels, PPBG levels and HbA1c levels showed a statistically significant decrease in the respondents belonging to experimental group. The mean Hb levels increased significantly in subjects belonging to experimental group after intervention. The mean FBG, PPBG levels and Hb levels were significantly different between respondents belonging to control and amla extract groups.

Conclusion: Intervention with amla extract improved the blood glucose profile and haemoglobin levels of the diabetic respondents.

Keywords: Amla, Type 2 Diabetes Mellitus, Blood glucose levels, HbA1c, Haemoglobin.

INTRODUCTION

"The metabolic alterations in T2DM are characterized by hyperglycemia resulting from defects in insulin secretion, action or both. Chronic hyperglycemia of diabetes is responsible for long term damage, dysfunction and eventually the failure of organs, especially the eyes, kidneys, nerves, heart and blood vessels. In developing countries, the diabetes epidemic is accelerating and affecting a majority of young people" (American Diabetes Association, 2009). Population increase, aging, urbanization, and obesity add to the growing prevalence of diabetes (Wild et al., 2004).

Genetic and lifestyle factors, especially a high calorie intake and little exercise result in T2DM, which is now exploding globally owing to the acceptance of Western habits (Diamond, 2011).

There are a number of medicinal plants which offer benefits beyond nourishment. Amla fruit is one of them and supports healthy aging (Majeed et al., 2009). Herbs and spices

enhance flavour of food and exert medicinal effects on health (Desouza et al., 2005; Saeed and Tariq, 2006).

Among the herbal drugs Phyllanthusemblica (Amla) occupies a prominent place in the context of such medicinal values. Amla is an excellent source of vitamin C, some minerals, gallic acid and tannins. It is known for its antioxidant properties and for its therapeutic effects, and is a major component in more than hundred herbal formulations that are widely used in India and other countries. Amla also has potent antibacterial, hepatoprotective, anti-diabetic, anticancer, anti-obesity, antiulcer, antihypercholesterolemic, antidyslipidaemic and antioxidant properties (Khan, 2009; Reddy et al., 2010).

Objective: The present study was undertaken with the objective of evaluating the role of Amla Extract supplementation on glycemic profile. The study also aimed to see the change inHbA1c and haemoglobin levels of adult men and women with T2DM after amla supplementation.

METHODOLOGY

Study design: Considering the inclusion criteria, 90 adult men and women were purposively selected for the present study, from a Diabetes Clinic in Jaipur city. From the selected sample, 60 subjects constituted the experimental group and the remaining 30 subjects constituted the control group. The respondents in the experimental group received 1g of Amla extract per day (capsule form) for a period of 3 months. The respondents in the control group did not receive any amla supplementation during the period of study.

The blood glucose levels (both FBG and PPBG), HbA1c levels and Hb levels were assessed before and after intervention using autoanalyser.

Inclusion criteria comprised of:

- adults with Type 2 diabetes mellitus,
- age 35 to 45 years,
- fasting blood sugar levels between 126-300 mg/day,
- taking Glimepiride + Metformin (1:500mg/day),
- adults who gave their consent to participate in the study and
- those living in Jaipur city only.

Intervention and assessments: In the amla extract group, the respondents were given 1g of amla extract/day (capsule) for a duration of 3 months. FBG, PPBG, HbA1c and Hb levels were tested at pre and post stages of intervention. The present study was approved by Sanjeevani ethics committee. Each respondent was given 15 doses for 15 days (one dose per day) at one time. The researcher regularly contacted the respondents to ensure compliance. Arjuna Natural Extracts Ltd, Kerala, provided the amla extract used in this study.

RESULTS AND DISCUSSION

The mean age of men was 39.89± 3.71 years and that of women was 39.59 ± 3.94 years. The effect of amla extract supplementation on FBG and PPBG is depicted in Fig. 1 and on HbA1c and Hb levels of the subjects is presented in Fig. 2.

It was observed from the results that there was a highly significant reduction in the mean FBG and PPBG levels (Fig. 1) and HbA1c levels (Fig. 2) and also a significant increase in the mean hemoglobin levels after consumption of amla extract (Fig. 2). Table 1 shows the difference in means in all the parameters studied. It is clear from the results that all the blood glucose parameters reduced to a great extent in respondents belonging to the amla extract group.

A highly significant increase in mean haemoglobin levels of respondents belonging to amla extract group was observed after intervention (Fig. 2).

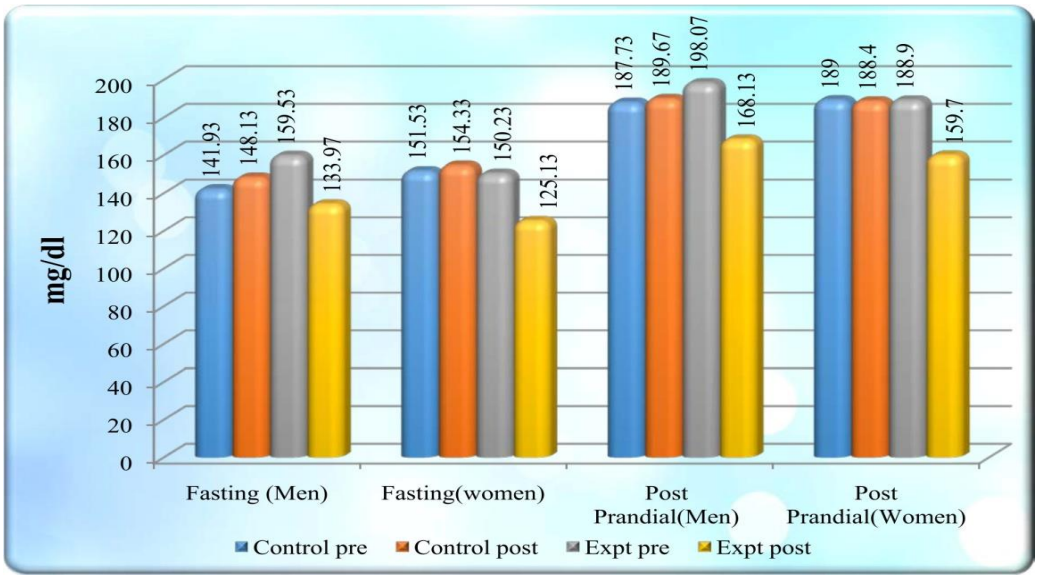

Fig. 1: Mean blood glucose levels of the respondents belonging to experimental and control groups at pre and post stages of intervention

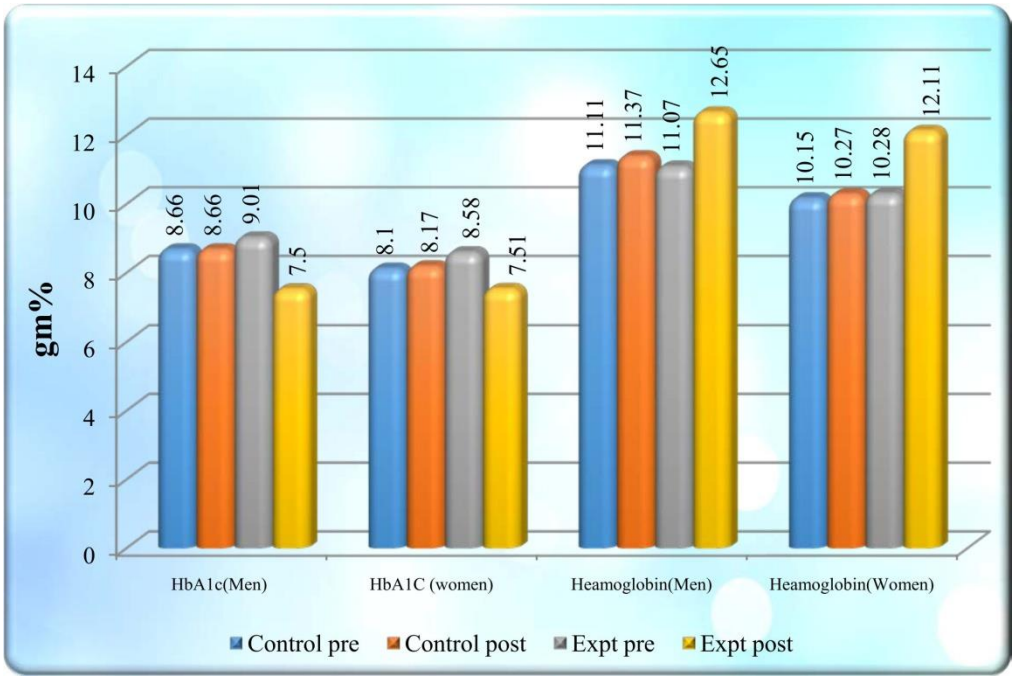

Fig. 2: Mean HbA1C and haemoglobin levels of the respondents belonging to experimental and control groups at pre and post stages of intervention

Table 1: Comparison of mean difference (from pre to post intervention) of blood glucose parameters and haemoglobin levels of respondents belonging to experimental and control groups

S. No.	Parameters	Difference between mean values from baseline to post intervention	
		Control group	Experimental group
1.	Fasting blood glucose levels (mg/dl)	4.5±7.93	-25.33±8.85
2.	Post prandial blood glucose levels (mg/dl)	0.67±6.32	-29.57±12.97
3.	HbA1c levels (g %)	0.03±0.2	-1.29±0.51
4.	Haemoglobin levels (g %)	0.19±0.56	1.71±0.72

Management of diabetes consists of use of insulin, hypoglycaemic drugs, diet and lifestyle modification. The benefits of amla in prevention of diabetes may be due to the low molecular hydrolysable tannins and their antioxidant properties. Amla possesses antioxidant, anti hyperglycemic and iron absorption enhancing properties (Khan 2009; Gopalan and Mohanram, 2004).

The present study reveals that supplementation of amla extract resulted in a highly significant reduction in the mean blood glucose parameters (FBG, PPBG and HbA1c levels) in the amla extract group. These results are supported by other researches (Gupta et al., 2016; Sri et al., 2013; Akhtaret al., 2011; Shah et al., 2010; Suryanarayana et al., 2004). It was

concluded from these studies that amla consumption is elemental in lowering the fasting as well as post prandial blood glucose levels and HbA1c levels.

Treatment of diabetic rats with amla supplementation (100 mg per day) reduced the blood glucose levels and subsequently increased insulin levels (Nair et al., 1992). Methanolic extract supplementation of E. officinalis (100 mg per day) in diabetic rats reduced fasting blood glucose levels and exhibited antioxidant effect by scavenging of free radicals (Sabu and Kuttan, 2002). Administration of methanolic extract of amla for 45 days in type-2 diabetic rats showed an increase in insulin level which may be exhibited by restoration of β-cells of pancreas. The hydro-methanolic extract of amla at different doses in STZ-induced diabetes in rats decreased fasting blood glucose levels by increasing insulin levels (Nain et al., 2012).

Kalekar et al. (2013) and Kasabri et al. (2010) have demonstrated that extract of *E. Officinalis* (*in vitro)* increased the insulin level by promoting the glucose-stimulated insulin secretion. It has been shown that *E. Officinalis* extractin 3T3L1 adipocyte cell culture (*in vitro*) at concentration of 200 µg/ml stimulated glucose uptake in adipocyte cells which showed that amla possessed insulin sensitizing and glucose stimulatory activity, this mechanism improved post prandial glucose levels in the body.

Oral administration of amla for 45 days in diabetic rats decreased blood sugar level by stimulating the release of insulin and glycogen synthase and lowered oxidative stress by elevating glutathione level (Babu and Stanely, 2004).

Polyherbal drug i.e., amla, on oral administration in STZ-induced diabetic rats reduced blood glucose levels, cholesterol and triglyceride (TG) levels in serum and reduced oxidative stress thus, ameliorated kidney and liver dysfunction in diabetic subjects (Thakkar and Patel, 2010). An amla product given to diabetic rats prevented PPBG levels and oxidative

stress by inhibiting advanced glycation end products and ameliorated glucose metabolism (Rao et al., 2005).

Kim et al. (2010) have observed antihyperglycemic activity of amla. Amla is also used in treating acute pancreatitis in rats (Sidhu et al., 2010). The amla fruit extracts may lower the risk of diseases like diabetes and co morbidities (Nampoothiri et al., 2010; Reddy et al., 2010).

Tirgar et al. (2010) concluded that the fresh juice and extract of amla fruit have antidiabetic activity.

Resmi et al. (2016) evaluated the effectiveness of herbal amla extract given for a period of 90 days, enhancing the level of haemoglobin levels of adolescent girls. The mean difference was statistically significant at $p<0.05$.

Being rich in phytochemicals and vitamin C, amla helps in iron absorption and preventing anemia (Gupta et al., 2016). Vitamin C promotes absorption of soluble non-haeme iron. This advantage can be obtained with vitamin C present in amla (Siegenberg et al., 1991). The study results clearly indicated that amla Extract can be used in conjunction with the allopathic drugs to improve the glycaemic profile and levels of haemoglobin in the diabetics. Hence, amla can act as a supportive therapy in the treatment of diabetes.

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