TO EVALUATE THE ANTI-HYPERGLYCAEMIC POTENTIAL OF EUGENIA JAMBOLANA (JAMUN) WINE IN HUMAN TYPE II DIABETES MELLITUS

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Abstract

Plants are the major sources in Indian system of medicine and other ancient system in the world.E.jambolana is being widely used to treat diabetes by the traditional practitioners over many centuries.The present study was conducted to find out theanti-hyperglycaemic, properties of Jamun wine on human subjects suffering from type II diabetes mellitus. They were given the dose 200 mlJamunwine per day for 21 days and it was observed that their blood glucose which was high earlier and decrease significantly after Jamun wine consumption. Similarly kidney and liver functions was decrease significantly after wine consumption. Thus we can conclude that Jamun wine found as herbal medicine for the treatment of diabetes without any toxic or side effects. The studies provide important information foranti-hyperglycaemicproperties of Jamun wine on human subjects suffering from type II diabetes mellitus.

Keywords: Drug, Herbal, Blood Glucose and Kidney

Introduction

Diabetes mellitus is a term described as a metabolic disorder of multiple aetiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. Diabetes mellitus is the most common of the endocrine disorders and global health problem today (Zimmet 2001; Amos et al., 1997). Based on WHO recommendation, diabetes mellitus is classified into three major subtypes: type I (insulin dependent diabetes mellitus, IIDM), type II (non-insulin dependent diabetes mellitus, NIIDM) and malnutrition related diabetes mellitus. IDDM or juvenile – onset diabetes results from a cellular mediated autoimmune destruction of the β – cells of the pancreas (Aikinsonet et. al., 1994; Takeshi et al., 2002). However, NIDDM or adult onset diabetes results from the development of insulin resistance and the affected individuals usually have insulin deficiency. Since most important pathological process during the development of diabetes involves three key organs, i.e. pancreatic islets, liver and skeletal muscles, almost all the conventional therapies are aimed at these organs. However much of the clinical and economical toll of diabetes arises from complications of the disease, such as capillary basement membrane thickening, retinopathy, nephropathy and accelerated arteriosclerosis (Wan, et al., 1993). The allopathic drugs such as Sulphonylurea, biguanides and α – glycosidase inhibitors are used in the treatment of hyperglycemia in diabetes mellitus in last decades. Use of these therapies is restricted by their pharmacokinetic properties, secondary failure rates and accompanying side effects (Melinda, 1988). Unfortunately, some patients developed complications and thus need for some other therapy was realized. This leads to increase demand for herbal products with anti-diabetic activity and less side effects. Eugenia jambolana belongs to the Myratace family and is commonly called Jamun or jambul in Hindi, Black Plum or Black Berry in English and Nederu in Telugu. E.jambolana is being widely used to treat diabetes by the traditional practitioners over many centuries. Various parts of this plant have been recognized to posses several medicinal properties in the folklore system of medicine (Sharma et al., 2006). Bark of the Jamun plant is astringent, refrigerant, carminative, diuretic, digestive, antihelminthic, febrifuge, constipating, stomachic and antibacterial. The seeds are used to treat diabetes, pharyngitis, spleenopathy, urethrorrhea and ringworm infection. The leaves are antibacterial and used to strengthen the teeth and gums and have also been extensively used to treat diabetes, constipation, leucorrhoea, stomachalgia, fever, gastropathy, strangury, dermopathy (Jagetiaet al., 2002). Fruit and its juice contain a biochemical called jamboline which is believed to check the pathological conversion of starch into sugar in case of increased production of glucose. Since the Jamun fruit is available for a very short period so it can be preserved for a very long period by fermenting the Jamun pulp (Chowdhuryet al., 2007) using it as a drug for treating diabetes. Our objectives of the present studies are: to evaluate the anti-diabeticproperties of Jamun wine on human subjects.

Materials & Methods

Selection of subjects: A diabetes clinic is organized by School of Studies in Biotechnology, Jiwaji University, Gwaliorunder the supervision of an ayurvedic physician. From the diabetes clinic a total of 20 subjects were selected for the study out of which 11 subjects were having type 2 diabetes mellitus, 6 subjects were selected as a normal control group and 3 subjects were selected as a normal treated group. All the subjects selected for the study were with duration of diabetes disease <2 years, their mean age was >45 years, and weight 45-80 kg.

Jamun Wine:Jamun wine was provided by Department of Biotechnology, DRDE (Defence Research Development & Establishment), Gwalior (M.P.). We have given the dose of 200 ml Jamun wine per day to the subjects for 21 days. The Jamun wine was stored at 4∘C.Sample Collection: Fasting blood glucose samples obtained at weekly intervals were collected into EDTA. Plasma was immediately separated by

low speed centrifugation (2500g for 10 min) and Stored at –20°Cprior to analysis. The selected subjects were asked to avoid food for 12 hrs or overnight. The blood sample was withdrawn from venous vein, the serum was separated and stored at -20°C for the analyses of liver function markers (SGOT, SGPT and Bilirubin).

Analysis of Biochemical Parameters
Estimation of glucose concentration: Fasting and post prandial blood glucose level was estimated by glucose oxidase-peroxidase method, employing commercial kits manufactured by Crest Biosystems, India Pvt. Estimation of Kidney function::The kidney function markers such as serum creatinine(Mod. Jaffe's Kinetic method), serum urea (GLDH Kinetic method) and serum uric acid (Uricase / PAP method)were estimated by using kits manufactured by Crest Biosystems, India, Pvt. Ltd.Estimation of liver function: Liver function markers such as Serum Glutamate Pyruvate Transaminase (SGPT), Serum Glutamate Oxaloacetate Transaminase (SGOT) (Modified IFCC method) and Total Biliburin(Modified Jendrassik and Grof's method) were estimated by commercial kits manufactured by Crest Biosystems, India Pvt Ltd.

Results
The present study was focused on anti-hyperglycaemic properties of Eugenia jambolana (Jamun) wine in human subjects suffering from Type II Diabetes Mellitus. The data were collected from the subjects during, before and after 21 days of E.jambolana (Jamun) wine therapy and it was statistically analyzed using paired't' test. The observations on various parameters studied are detailed as follows:
Comparison between Blood Glucose before and after Jamun wine therapy with monitoring the Kidney and liver function are as follows
1. EFFECT OF E JAMBOLANA(JAMUN) WINE ON:
(A) Blood Glucose Level: The basal levels of blood glucose in normal group treated with wine were maintained at constant level throughout the experimental period. The blood glucose was significantly elevated in diabetic subjects before Jamun wine therapy whereas a significant decrease in blood glucose level was recorded after Jamun wine therapy. No significant decrease in blood glucose level was observed in normal control and normal group treated with Jamunwine after 21 days of therapy. A significant decrease i.e. 25.4 %(P < 0.05) was observed in blood glucose level of diabetic subjects treated with Jamun wine (200 ml/day) which was comparable to decrease 27.6 % (P<0.01) in blood glucose level of diabetic subjects treated with diabegon (Figure A) Table 1.
(B) Kidney Function
(I)Urea Level: No significant decrease in Urea level was observed in normal control and normal subjects treated with Jamunwine after 21 days of therapy. A significant decrease i.e. 47.6%(P < 0.05) was observed in urea level of diabetic subjects treated with Jamun wine (200 ml/day) which was significantly higher than the decrease in urea level of diabetic subjects treated with diabegon (33.2%) (P <0.05) (Table

B).(II)   Uric Acid Level: No significant decrease in uric acid level was observed in normal control and normal subjects treated with Jamunwine after 21 days of therapy. There was a decrease i.e. 36.8% was observed inuric acid level of diabetic subjects treated with Jamun wine (200 ml/day) which was significantly higher than the decrease in uric acid level of diabetic subjects treated with diabegon (22.4%).(III)Creatinine Level: No significant decrease in creatinine level was observed in normal control and normal subjects treated with Jamunwine after 21 days of therapy. A significant decrease i.e. 47.5 %(P < 0.01) was observed in creatinine level of diabetic subjects treated with Jamun wine (200 ml/day) which was comparable to decrease in creatinine level of diabetic subjects treated with diabegon (49.7 %)(P < 0.01).
(C) Liver function
(I)Serum Glutamate oxaloacetate Transaminase (SGOT):No significant decrease in Serum Glutamate Oxaloacetate Transaminase (SGOT) level was observed in normal control and normal subjects treated with Jamunwine after 21 days of therapy. A significant decrease i.e. 31.3 %(P < 0.05) was observed inSerum Glutamate oxaloacetate Transaminase (SGOT) of diabetic subjects treated with Jamun wine (200 ml/day) which was comparable to decrease in Serum Glutamate oxaloacetate Transaminase (SGOT) of diabetic Subjects treated with diabegon (29.5 %)(P < 0.01) .(II) Serum Glutamate Pyruvate Transaminase(SGPT):No significant decrease in Serum Glutamate Pyruvate Transaminase (SGPT) level was observed in normal control and normal subjects treated with Jamunwine after 21 days of therapy. There was a decrease i.e. 17.7 % was observed inSerum Glutamate Pyruvate Transaminase (SGPT) of diabetic subjects treated with Jamun wine (200 ml/day) which was slightly lesser than the Serum Glutamate Pyruvate Transaminase (SGPT) of diabetic subjects treated with diabegon (20.3%) .(III) Bilirubin: No significant decrease in total serum bilirubin level was observed in normal control and normal subjects treated with Jamunwine after 21 days of therapy. No significant change in total serum bilirubin level was observed in diabetic subjects after Jamun wine therapy or diabegon treatment in diabetic subjects.

TABLE 1
COMPARISON OF BLOOD GLUCOSE LEVEL BEFORE AND AFTER 21 DAYS OF E.JAMBOLANA(JAMUN)WINE THERAPY

Groups	Initial (0 Day)	Final (21 Days)	Mean Diff.	S. D.	"t" value
Normal Control Group(n=6)	88.7±7.1	86.9±4.9	1.85 (2.08 %)	3.54	0.52
Normal on Wine Therapy(n=3)	86.4±3.1	81.2±4.09	5.15 (5.9%)	2.98	1.73
Diabetic on Wine Therapy(n=5)	185.9±35.8	138.6±27.6	47.3 (25.4%)	20.24	2.34*
Diabetic on Diabegon Therapy(n=6)	181.3±22.1	131.2±18.08	50.09 (27.6%)	11.67	4.29**

Values are given as Mean ± S.D.
Diabetic with wine therapy group (Experimental Groups) are compared with diabetic diabegon treated group.
Values are statistically significant at P<0.05(*)
Values are statistically significant at P<0.01(**)
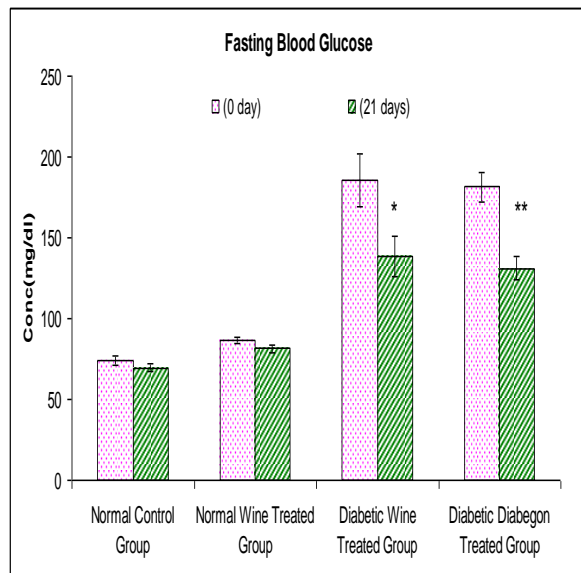Figures in parenthesis indicate percent change (%)

Figure A: Effect of 21 days of E.jambolanawine therapy on blood glucose levels. Blood glucose levels of 12-hour fasting subjects (Normal Control: n=6, Normal Wine Treated Group: n=3, Diabetic Wine treated group: n=5, Diabetic Diabegon treated group n= 6) was analysed from venous blood samples once before therapy and at end of therapy.

Discussion

Diabetes mellitus (type-1 or type-2) is characterized by increase in blood glucose level. Jamun fruits are universally accepted to be very good for medicinal purposes especially for curing diabetes because of its effect on the pancreas. The fruit, its juice and the seed contain a biochemical called 'Jamboline' which is believed to check the pathological conversion of starch into sugar in case of increased production of glucose. No toxic reactions were observed, shows us the nontoxic nature of Jamun wine at the selected doses of 200ml wine per day till the end of the experimental. Anti-diabetic action of E. Jambolana exerts a dual effect namely a combination of mechanism of action sulfonylurea and biguanids .It increases glucose -6- phosphate content in liver indicating an overall increase in glucose influx thus it is having an overall effect in increasing glucose utilization (Grover et al., 2000). It may be acting as a hypoglycaemic agent by increasing the insulin content through increasing activity of cathepsin B (Bansal, et al., 1981).Glucose-6-phosphatase, a key enzyme in gluconeogenesis, plays an important role in glucose homeostasis in the liver (Berg et al., 2001) the decreased levels of the enzyme observed in diabetic wine treated subjects may be due to suppression of hepatic gluconeogenesis and glucose output from the liver. The elevation in alanine aminotransferase in the liver observed in diabetic subjects the increased level of amount before the therapy may be attributedto increase gluconeogenesis of transmission. In our study, the treatment with Jamun wine was found to significantly decrease the enhanced transaminase activity. Catabolism of the protein and nucleic acids result in the formation of non-protein nitrogenous compounds urea and creatinineIn diabetes mellitus, the amino acid breakdown in the liver results in an increased production of urea and creatinine but there is no difference found.

Conclusion

Jamun wine is an alcoholic beverage and easily available. Diabetic patients those consumed wine regularly in their diet showed good decrease in fasting blood glucose as well as lipid levels in blood. The anti-hyperglycaemic effects of Jamun wine with the dose of 200 ml/day were potent and prolonged than the Ayruvedic drug (Diabegon).In our study showed that Jamun wine was totally anti-hyperglycaemic but it is a complementary therapy with no side effect which comparable to allopathic drug. Jamun wine consumption can be used for treatment of diabetic subjects having low to moderate level of diabetes. Our study showed that a red wine prepared from Jamun and its Fruits rich in anthocyanins which have medicinal properties likes anti-diabetic.

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