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Comparative study on supplementation effect of *Momordica charantia* Linn. and *Emblica officinalis* Gaertn. on lipid profile of type II diabetic patients in Allahabad, Uttar Pradesh, India

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Abstract

Diabetes is a metabolic syndrome, characterized by hyperglycemia and glycosuria. International Diabetes Federation (2015) reported 69.1 million cases of diabetes in India. Deranged carbohydrate metabolism may lead to secondary metabolic complications, mainly associated with lipid and lipoproteins. From the ancient times, India is known as a hub of herbal medicines. Many Indian plants have been investigated for their beneficial use in diabetes. Keeping this fact in mind, this study has been conducted with 150 known diabetic patients in the age group of 35-60 years, out of which, 50 patients were supplemented with fresh fruit juice of *Momordica charantia* Linn. and 50 patients were given dry fruit powder of *Emblica officinalis* Gaertn. as supplement and compared with 50 diabetic patients as diabetic control group and 50 normal healthy individuals as a normal control group. Both types of supplementations were given to the patients for 8 weeks with their regular medication, given by their physician. Lipid profile panel tests, *viz*., total cholesterol, HDL cholesterol, LDL cholesterol and VLDL cholesterol were analyzed for the comparative study. It was concluded that the medicinal plants have the potential to control the secondary complications, associated with type II diabetes, mainly cardiac failure. Supplementation with *M. charantia* was more effective than *E. officinalis*.

Key words : *Momordica charantia* Linn., *Emblica officinalis* Gaertn., diabetes, lipid profile, oxidative stress

1. Introduction

Diabetes is a chronic disorder in metabolism of carbohydrate, protein and fat due to absolute or relative deficiency of insulin secretion with/without varying degree of insulin resistant (Barar,2000). Diabetes mellitus is a group of metabolic disorder with one common manifestation and hyperglycemia. Chronic hyperglycemia may cause damage to eyes, kidney, nervous, heart and blood vessels (Mayfield,1998). In the current scenario, it is found that oxidative stress is one of the leading cause for cell injury or even cell death which can essentially by two mechanism, necrosis and apoptosis (Gueteens *et al.,* 2002). Oxidative stress is a harmful condition that occur when excess of ROS (reactive oxygen species) and decrease in antioxidant level, this may cause tissue damage by physical, chemical, physiological factors that lead to tissue injury in human and causes different diseases (Tiyan *et al.,* 2007). Antioxidants are substances that neutralize free radicals or their action (Sies, 1996). Indian traditional medicines, having a great potential to reduce the blood glucose as well as oxidative stress (Rajeshwari *et al*., 2013). Ayurveda and other traditional medicinal systems for the treatment of diabetes describe a number of plants as a herbal drugs (Welihinda *et al*.,1982). Traditional medicinal plants are very effective in treatment of diabetes mellitus (Tiwari and Rana, 2015). Many researchers reported that *E. officinalis* have a great potential to reduce the blood sugar level (Suryanarayanan *et al*., 2004; Dhanlakshmi *et al.,* 2007), on the another hand, *M. charantia* is also reported for its hypoglycemic activity (Bailey *et al.,* 1985; Uebanso *et al.*,2007; Shibib *et al.*,1993). By keeping these results in mind, the present study is designed for comparative evaluation of these herbal medicines for their hypolipidemic action. Because it is reported that lipids play an important role in pathogenesis of diabetes mellitus (Cadenas and Davis, 1996). During diabetes mellitus, there is alteration in lipid and lipoproteins that increases the risk of coronary artery diseases (Valko *et al.*,2007).

2. Materials and Methods

Present study was taken up after the approval by the Institutional Ethical Committee, SHIATS-Allabhabad, in the meeting, held on 4 December, 2010 (Reg. No. 2010/A/003). A total of 150 known diabetic patients of age group of 35-60 years with fasting blood sugar (FBS) more than 200 mg/dl were selected with their written consent for this study. In the study group, 85 females and 65 males were given their written consent. Out of 85 females, 36.46% were between the age group of 45-50 years and 29.41% were between 50-55 years. On the another side, out of 65 males, 36.92% were

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between the age group of 45-50 years and 32.30% were between 50-55 years. Total study group was comprised of 200 subjects, out of which, 150 subjects were known diabetic patients. They were divided into three groups: Group I had 50 diabetic patients and they were supplemented with *M. Charantia* and Group II had 50 diabetic patients and they were supplemented with *E. officinalis.* Both the groups compared with 50 known diabetic patients as diabetic control Group III and 50 normal healthy people, having fasting blood sugar level 70-110mg/dl as normal control Group IV and without any metabolic complications. Both type of supplementations were given to the patients for 8 weeks with their regular medication, given by their physician. Eight grams powder of *E. officinalis* fruit (Sitasawad *et al.*, 2000) and 100 ml raw fruit juice of *M. charantia*, prepared at home by the simple grinding, followed by filtration, was given once in a day to the patients, preferably in morning, during empty stomach for supplementation (Shanmugasundaram *et al.*, 1990). Total cholesterol (Roeschlau *et al.*,1974), HDL cholesterol (Burstin *et al.*, 1970), triglycerides (Trinder,1968), LDL cholesterol and VLDL cholesterol (Friedewald *et al.*, 1972) were compared for this study.

Data were analysed for significance level by Graph pad online Software for t test analysis. This was done by online using www.graphapad.com/quickcals/.

3. Results

The effect of plant extracts on plasma lipid profile levels is presented in Table 1. The total cholesterol, triglycerides, LDL cholesterol and VLDL cholesterol level, were significantly increase while HDL cholesterol was decreased in diabetic control group (DC) as compare to normal control (NC) group. When diabetic patients supplemented with fruit extract of *M. charantia* and fruit powder of *E.officinalis* for eight weeks, the levels of total cholesterol, triglycerides and LDL cholesterol and VLDL cholesterol significantly decreased as compared to the diabetic control group. On the other hand, HDL cholesterol which is known as good cholesterol is significantly raised in supplemented group as compared to control group. Data presented in Table 2 showing that during the comparative evaluation of hypolipidemic action of herbal plants, supplementation with *M. charantia* found more effective rather than *E. officinalis.*

Table 1: Showing Mean ± SD of the comparative supplementation effects of *M. charantia* and *E. officinalis* on lipid profile of type II diabetic patients

S. No.	Parameters	(Group I) supplemented with *M. charentia* n = 50	(Group II) supplemented with *E. officinalis* n = 50	(Group III) diabetic control n = 50	(Group IV) normal control n = 50
1.	Total cholesterol(mg/dl)	228.54 ± .86	257.44 ± 26.0	302.48 ± 35.13	191.00 ± 28.57
2.	HDL cholesterol(mg/dl)	41.56 ± 11.29	36.85 ± 17.15	28.05 ± 20.89	38.76 ± 5.89
3.	LDL cholesterol(mg/dl)	147.96 ± 7.20	174.81 ± 7.47	205.30 ± 10.30	117.22 ± 23.61
4.	VLDL cholesterol(mg/dl)	39.02 ± 4.94	45.78 ± 5.69	69.13 ± 8.38	35.02 ± 8.21
5.	Triglycerides(mg/dl)	195.10 ± 24.88	228.90 ± 28.44	345.65 ± 41.88	175.10 ± 41.07
6.	HbA1 C%	6.95 ± 0.61	7.58 ± 1.05	11.99 ± 7.28	6.90 ± 0.47
7.	Plasma glucose (mg/dl)	142.54 ± 26.75	151.04 ± 10.62	230.04 ± 42.31	95.52± 7.96

Table 2: Showing comparative supplementation effects of *M. charantia* and *E. officinalis* on lipid profile of type II diabetic patients in increment percentage or decrement percentage corresponding with diabetic control

S.No.	Parameters	(Group I) supplemented with *M. charantia*	(Group II) supplemented with *E. officinalis*
1.	Total cholesterol(mg/dl)	14.01% ↓	8.04% ↓
2.	HDL cholesterol(mg/dl)	19.40% ↑	13.55% ↑
3.	LDL cholesterol(mg/dl)	16.23% ↓	8.02% ↓
4.	VLDL cholesterol(mg/dl)	27.66% ↓	20.32% ↓
5.	Triglycerides(mg/dl)	27.84% ↓	20.32 % ↓
6.	HbA1 C%	37.50% ↑	22.50% ↑
7.	Plasma glucose (mg/dl)	23.48% ↓	20.73% ↓

4. Discussion

Alteration in a lipid profile is a pathological imbalance due to diabetes. In diabetic state, serum cholesterol level was elevated due to lack of insulin which lowers the activity of HMG Co-A and increase the cholesterol concentration (Kwietrovich, 2000). *M. charantia* normalized these effects, possibly by controlling the hydrolysis of certain lipoproteins and their selective uptake and metabolism by different tissues (Laakso and Pyrola, 1985). Flavonoids of *E. officinalis* were found to decrease the activity of enzyme HMG Co-A and increase the degradation and elimination of cholesterol from the body (Scartezzini and Saproni, 2000). It is revealed from the present study that *M. charantia* and *E. officinalis* are effective and have good potential to reduce the blood glucose level and this result is also supported by the findings of Dang (2012) and Patel *et al.* (2009). The primary constituents responsible for the hypoglycemic property of *M. charantia* is charantin-insuline like peptide (Harinantenaina *et al.*, 2006). It is also supported by the findings of Yadav and Srivastava (2014) that flavonoids and alkaloids that are present in *M. charantia* fruits, having a good

hypoglycaemic activity. A study conducted by Devi and Urooj (2014) also reported for antihyperglycemic and hypolipedimic effect of *Morus indica* L. in streptozotocine induced diabetic rats. It is also reported that *E. officinalis* has strong reducing power and scavenging capacity which leads to the management of free radicals (Luqman and Kumar, 2012) which is the main cause of lipid alteration. It is concluded that medicinal plants have the potential to maintain the secondary complications, associated with type II diabetes, mainly cardiac failure. Among the two medicinal plants, *M. charantia* was found to be better than *E. officinalis.* Although, the mode of preparation of both the fruits is different, therefore, we cannot strongly recommend the *M. charantia* as of now and further research is suggested in this direction.

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Conflict of interest

We declare that we have no conflict of interest.

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