

Study on Hypoglycemic Effect of Bittergourd Powder on Diabetic Patients in Selected Subjects

Ramakrishna Prasad N¹, Hemalatha M. S.²

¹Prasad Clinic, Seethangoli Post, Kasaragod, Karnataka State Open University, Mysore, Karnataka, India
Email: [drmsheemap\[at\]gmail.com](mailto:drmsheemap[at]gmail.com)

²Department of Food Science and Nutrition, Karnataka State Open University, Mysore – 570 006, India
Corresponding Author Email: [drmsheemap\[at\]gmail.com](mailto:drmsheemap[at]gmail.com)
Tel: + 91 - 9482566371

Abstract: *Diabetes mellitus is a common metabolic disorder characterized by hyperglycemia and its prevalence for all age - groups worldwide was estimated to be 2.8% in 2000 and is likely to be raised to 4.4% in 2030. The complications of Diabetes mellitus such as cardiomyopathy, nephropathy, neuropathy, retinopathy are less common in people who have well - controlled blood sugar levels. Bittergourd (Momordica charantia) contains phyto - nutrient, polypeptide and charantin which are known to have hypoglycemic effect thus being responsible for reduction of blood sugar levels in the treatment of diabetes. Hence this study was conducted to evaluate the hypoglycemic effect of bittergourd powder on diabetic patients at Kasaragod district. Around 40 subjects both male and female between the age group of 40 – 60 years diagnosed for diabetes since 2 - 5 years were selected. Anthropometric measurements of the subjects were recorded, eating habits and life styles were documented through a questionnaire. The fasting blood sugar and post prandial blood sugar of subjects were determined in the laboratory. All the subjects were administered 2g bittergourd powder along with honey orally for 45 days without any other medication. After completion of 45 days of oral administration, fasting blood sugar and post prandial blood sugar were determined. It was found that fasting blood sugar and post prandial blood sugar had decreased in 80% of the subjects. The data was suitably subjected to statistical analysis.*

Keywords: Diabetes mellitus, Bittergourd, Fasting blood sugar, Post prandial blood sugar

1. Introduction

Diabetes mellitus is a chronic medical condition characterized by high levels of glucose (sugar) in the blood (American Diabetes Association, 2009). It occurs either because the body does not produce enough insulin (a hormone produced by the pancreas that regulates blood sugar) or because the body's cells do not respond properly to insulin (Wilcox, 2005). Type 1 Diabetes is an autoimmune condition where the body's immune system attacks the insulin - producing beta cells in the pancreas, leading to little or no insulin production. It is usually diagnosed in children and young adults (Szablewski, 2014). Type 2 Diabetes is the most common type, where the body either resists the effects of insulin or does not produce enough insulin to maintain normal glucose levels (Bajaj & DeFronzo, 2003). It is often associated with obesity and tends to develop in adults over the age of 45, but it is increasingly occurring in younger age groups, including children, adolescents, and young adults (D'Adamo & Caprio, 2011).

Fasting Blood Sugar (FBS) and Postprandial Blood Sugar (PPBS) are two important blood glucose tests used to diagnose and monitor diabetes mellitus (Datta et al, 2014). FBS test measures blood glucose levels after an individual has fasted for at least 8 hours, usually overnight. It helps determine how well the body maintains blood glucose levels when no food has been consumed for a significant period (Mustafa Kanat et al, 2012). PPBS test measures blood glucose levels after an individual has eaten, typically 2 hours after a meal. It assesses how well the body responds to the glucose load from a meal and how effectively insulin is working (Saha et al, 2014). Regular monitoring through FBS and PPBS tests is essential for managing diabetes and

preventing complications associated with high blood sugar levels (Ahmed et al, 2013).

Bitter gourd, also known as bitter melon or *Momordica charantia*, is a tropical and subtropical vine that belongs to the gourd family and is widely known for its medicinal properties (Bakare et al, 2010). It is particularly valued in traditional medicine systems such as Ayurveda, Traditional Chinese Medicine (TCM), and various folk remedies (Bharathi, & John, 2013). Bitter gourd contains antioxidants such as vitamin C, which help combat oxidative stress and protect cells from damage (Kubola & Siriamornpun, 2008). Its anti - inflammatory properties can help reduce inflammation in the body, which is linked to various chronic diseases (Ramadhar Kumar et al, 2010). Bitter gourd is renowned for its hypoglycemic properties, which can help lower blood sugar levels (Fang & Ng, 2011) Compounds like charantin, polypeptide - p, and vicine are thought to contribute to its insulin - like effects. It may enhance the body's ability to use insulin more effectively, which is beneficial for people with type 2 diabetes (Naik & Kokil, 2013).

Diabetes can lead to severe complications such as Cardiovascular disease, Nerve damage (neuropathy), Kidney damage (nephropathy), Eye damage (retinopathy), Foot damage, Skin conditions, Hearing impairment, Alzheimer's disease. Early diagnosis and effective management are crucial to prevent or delay these complications (Anjali et al, 2008). Keeping the importance of bittergourd, this study was planned to study the effect of supplementation of bittergourd on type 2 diabetes subjects.

Volume 4 Issue 8, August 2015

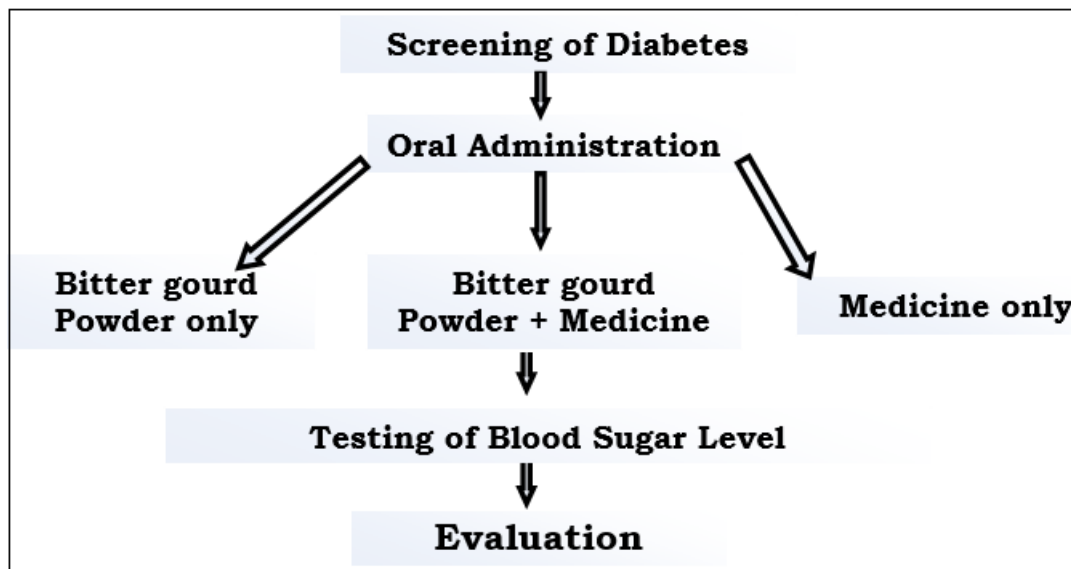
www.ijsr.net

Licensed Under Creative Commons Attribution CC BY

2. Methodology

- Patients (60 in Number) of either sex were selected at Prasad Clinic, Seethangoli Post, Kasaragod for the study between the age group of 40 - 60 years with diagnosed for diabetes since 2 - 5 years
- Anthropometric measurements of the subjects were recorded, eating habits and life styles were documented through a questionnaire.
- They were divided into 3 groups - One group was administered only bittergourd powder, second group were given both bittergourd powder and medicine, third group were administered only medicine
- Subjects were administered 2g bittergourd powder along with honey orally for 40 days
- Fasting blood sugar and post prandial blood sugar were determined prior to intervention and after intervention.

3. Design of Study



4. Results

4.1 Demographic Profile of Subjects

The study subjects were divided into three groups; in each group 20 subjects were allocated. Male subjects were more about 70% and remaining was female. All the subjects, age groups were between 40 to 60 years. The duration of diabetes mellitus was from 3 - 5 years. They experimental subjects were orally administered bittergourd powder for 40 days without any break.

4.2 Anthropometric profile of Subjects

Height and weight were recorded for all subjects. Body mass index was calculated, not much significant difference was observed between experimental and control subjects (Table 2). Similarly, there was no significant difference between the average values of Waist/Hip Ratio, Mid Upper Arm Circumference, Skin Fold Thickness and Mid Upper Arm Muscle Circumference.

4.3 Fasting and post-prandial sugar levels of Subjects

The fasting blood sugar and post - prandial sugar levels of subjects are represented in Figure 1. The laboratory investigation showed that there was slight decrease in fasting blood sugar and post - prandial sugar levels after intervention of bittergourd powder for 40 days. This was comparable to subjects with medication. There was also no much changes in subjects with bittergourd powder intervention and medication.

5. Discussion

Bitter gourd (*Momordica charantia*) has been extensively studied for its potential benefits in managing type 2 diabetes (Trakoon - osot et al, 2013). Its effects on type 2 diabetes are primarily attributed to several bioactive compounds that can influence blood sugar levels and insulin function (Habicht et al, 2014). The compounds present in bittergourd helps to reduce blood sugar level. Charantin is known for its blood sugar - lowering properties which can help reduce blood glucose levels by promoting glucose uptake and glycogen synthesis in the liver, muscles, and adipose tissue (Adewale et al, 2014). Polypeptide - p also known as plant insulin can mimic the action of insulin in the body, helping to lower blood sugar levels (Sangeetha & Vasanthi, 2009). Vicine contributes to hypoglycemic effects (Hui et al, 2009).

Bitter gourd may enhance the body's sensitivity to insulin, making it easier for cells to use glucose efficiently (Chaturvedi, 2012). This is crucial for managing type 2 diabetes, where insulin resistance is a common issue. Bitter gourd helps improve the uptake of glucose into cells, where it can be used for energy (Sridhar et al, 2008). This reduces the amount of glucose circulating in the blood. Some studies suggest that bitter gourd can inhibit the absorption of glucose from the intestine, thereby reducing postprandial (after meal) blood glucose levels.

Clinical trials have shown mixed but generally positive results. Some studies have demonstrated significant reductions in fasting blood glucose levels and HbA1c (a marker of long - term blood sugar control) in individuals

with type 2 diabetes who consumed bitter melon in various forms (juice, capsules, or cooked vegetable) (Konate et al, 2014). Numerous animal studies support the anti-diabetic effects of bitter melon, showing improvements in glucose tolerance, insulin secretion, and overall blood sugar management (Mohammady et al, 2012; Efird et al, 2014). The present study has partially proved with Human subjects, more pilot studies have to be conducted to establish the use of bitter melon in combatting Type 2 Diabetes. Bitter melon promises as a complementary treatment for managing type 2 diabetes due to its blood sugar lowering properties and potential to improve insulin sensitivity.

6. Conclusions

Anthropometric measurements did not vary much in different variations like orally administered by 2gm of Bitter melon powder, Bitter melon powder and Medicines and Medicines alone. The Fasting Blood Sugar Level of all the Subjects was similar before oral administration. The Fasting Blood Sugar Level of subjects administered with bitter melon powder and medicines were slightly less compared to other two variations. The Post prandial Blood Sugar Level of subjects administered with bitter melon powder and medicines were also slightly less compared to other two variations. These studies indicate that oral administration of Bitter melon powder reduced blood sugar levels in patients. These studies also indicate that oral administration of Bitter melon powder without medication also reduces blood sugar levels in patients

References

- [1] Adewale OO, Oduyemi OI, Ayokunle O. Oral administration of leaf extracts of *Momordica charantia* affect reproductive hormones of adult female Wistar rats. *Asian Pac J Trop Biomed.*2014; 4 Suppl 1: S521–4.
- [2] Ahmed, F., Hoque, M., Alam, A. T., Ahmed, S., & Tasnim, N. (2013). HbA1C in Patients with Gestational Diabetes Mellitus. *Chattagram Maa - O - Shishu Hospital Medical College Journal*, 12 (3), 11–15.
- [3] American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care.*2009 Jan; 32 Suppl 1 (Suppl 1): S62 - 7
- [4] Anjali D Deshpande, Marcie Harris - Hayes, Mario Schootman, Epidemiology of Diabetes and Diabetes - Related Complications, Physical Therapy, Volume 88, Issue 11, 1 November 2008, Pages 1254–1264
- [5] Bajaj, M., DeFronzo, R. A. Metabolic and molecular basis of insulin resistance. *J Nucl Cardiol* 10, 311–323 (2003).
- [6] Bakare RI, Magbagbeola OA, Akinwande AI, Okunowo OW (2010) Nutritional and chemical evaluation of *Momordica charantia*. *J Med Plant Res* 4 (21): 2189–2193
- [7] Bharathi, L. K., John, K. J. (2013). Ethnobotany and Nutritive Value. In: *Momordica* genus in Asia - An Overview. Springer, India.
- [8] Chaturvedi, P., Antidiabetic Potentials of *Momordica charantia*: Multiple Mechanisms Behind the Effects, *Journal of Medicinal Food* 2012 15: 2, 101 - 107

- [9] D'Adamo E, Caprio S. Type 2 diabetes in youth: epidemiology and pathophysiology. *Diabetes Care.*2011 May; 34 Suppl 2 (Suppl 2): S161 - 5.
- [10] Datta, S., Pal, M., Mitra, R., Ganguly, A., Basu, S., Manna, S. Value of assessing post prandial and fasting plasma Glucose as a surrogate for glycated hemoglobin in Diabetic glycemic control. *World Journal of Pharmaceutical Research.*3 (9), 2014, 494 - 503
- [11] Efird, J. T.; Choi, Y. M.; Davies, S. W.; Mehra, S.; Anderson, E. J.; Katunga, L. A. Potential for Improved Glycemic Control with Dietary *Momordica charantia* in Patients with Insulin Resistance and Pre - Diabetes. *Int. J. Environ. Res. Public Health* 2014, 11, 2328 - 2345.
- [12] Fang, E. F. & Ng, T. B. Bitter Melon (*Momordica charantia*) is a Cornucopia of Health: A Review of its Credited Antidiabetic, Anti - HIV, and Antitumor Properties. *Current Molecular Medicine*, 11 (5), 2011, pp.417 - 436
- [13] Habicht, D. S., Ludwig, C., Ray - yu, Y., Michael, B. K. *Momordica charantia* and Type 2 Diabetes: From in vitro to Human Studies. *Current Diabetes Reviews*, 10 (1), 2014, pp.48 - 60
- [14] Hui, H., Tang, G. & Go, V. L. W. Hypoglycemic herbs and their action mechanisms. *Chin Med* 4, 11 (2009).
- [15] Konate K, Yomalan K, Sytar O, Zerbo P, Brestic M, Patrick VD, et al. Free radicals scavenging capacity, antidiabetic and antihypersensitive activities of flavonoid - rich fractions from leaves of *Trichilia emetica* and *Opilia amentacea* in an animal model of type 2 diabetes mellitus. *J Evid Based Complimentary Altern Med* 2014
- [16] Kubola, J & Siriamornpun, S. Phenolic contents and antioxidant activities of bitter melon (*Momordica charantia* L.) leaf, stem and fruit fraction extracts in vitro, *Food Chemistry*, 110 (4), 2008, Pages 881 - 890,
- [17] Mohammady, I., Elattar, S., Mohammed, S & Eweis, M. An Evaluation of Anti - Diabetic and Anti - Lipidemic Properties of *Momordica charantia* (Bitter Melon) Fruit Extract in experimentally Induced Diabetes. *Life Science Journal*, 2012; 9 (2): 363 - 374.
- [18] Mustafa Kanat, Andrea Mari, Luke Norton, Diedre Winnier, Ralph A. DeFronzo, Chris Jenkinson, Muhammad A. Abdul - Ghani; Distinct β - Cell Defects in Impaired Fasting Glucose and Impaired Glucose Tolerance. *Diabetes* 1 February 2012; 61 (2): 447–453.
- [19] Naik, S. R. & Kokil, G. R., Development and Discovery Avenues in Bioactive Natural Products for Glycemic Novel Therapeutics, Editor (s): Atta - ur - Rahman, *Studies in Natural Products Chemistry*, Elsevier, 39, 2013, Pages 431 - 466
- [20] Ramadhar Kumar, S. Balaji, R. Sripriya, N. Nithya, T. S. Uma, and P. K. Sehgal, In Vitro Evaluation of Antioxidants of Fruit Extract of *Momordica charantia* L. on Fibroblasts and Keratinocytes *Journal of Agricultural and Food Chemistry* 2010 58 (3), 1518 - 1522
- [21] Saha, S., Sarker N and Hira, A. "Design & implementation of a low cost blood glucose meter with high accuracy, " 2014 International Conference on Electrical Engineering and Information &

Communication Technology, Dhaka, Bangladesh, 2014, pp.1 - 6,

[22] Sangeetha, M. K & Vasanthi, H. R., Plant Kingdom Claims for Insulin, Sri Ramachandra Journal of Medicine, 2009, Vol.1 (1) 34 - 31.

[23] Sridhar MG, Vinayamoorthi R, Arul Suyambunathan V, Bobby Z, Selvaraj N. Bitter gourd (Momordica charantia) improves insulin sensitivity by increasing skeletal muscle insulin - stimulated IRS - 1 tyrosine phosphorylation in high - fat - fed rats. British Journal of Nutrition.2008; 99 (4): 806 - 812.

[24] Szablewski, L Role of immune system in type 1 diabetes mellitus pathogenesis, International Immunopharmacology, 22 (1), 2014, Pages 182 - 191

[25] Trakoon - osot, W., Sotaphun, U., Phanachet, P., Porasuphatana, S., Umaporn U. & Komindr, S. Pilot study: Hypoglycemic and antiglycation activities of bitter melon (Momordica charantia L.) in type 2 diabetic patients, Journal of Pharmacy Research, 6 (8), 2013, Pages 859 - 864

[26] Wilcox G. Insulin and insulin resistance. Clin Biochem Rev.2005 May; 26 (2): 19 - 39.

Table 1: Nutritive value of Bittergourd powder

Nutrients	Protein (g)	Folate (mcg)	Potassium (mg)	Vitamin A (IU)	Vitamin C (mg)
Bittergourd Powder	1	72	296	471	84

Table 2: Demographic Profile of Subjects

Parameters	2gms Bitter gourd Powder in Honey	2gms Bitter gourd Powder in Honey + Medicines	Medicines
Number of Subjects	20	20	20
Male	16	15	11
Female	04	05	09
Age (Years)	40 - 60	40 - 60	40 - 60
Duration of Illness (Average)	3 - 5 years	3 - 5 years	3 - 5 years
Duration of oral Administration	40 days	40 days	40 days

Table 3: Anthropometric Measurements of Subjects

Variations	Body Mass Index	Waist/Hip Ratio	Mid Upper Arm Circumference (cms)	Skin Fold Thickness (mms)	Mid Upper Arm Muscle Circumference (cms)
Bitter gourd powder only	26.5 ± 3.9	0.9 ± 0.02	29.9 ± 4.1	14.2 ± 1.7	25.1 ± 3.7
Bitter gourd powder + medicine	27.6 ± 3.9	0.9 ± 0.04	29.7 ± 3.0	15.2 ± 2.1	25.1 ± 2.8
Medicine only	28.9 ± 3.3	0.9 ± 0.04	30.7 ± 2.5	16.1 ± 1.9	25.7 ± 2.4

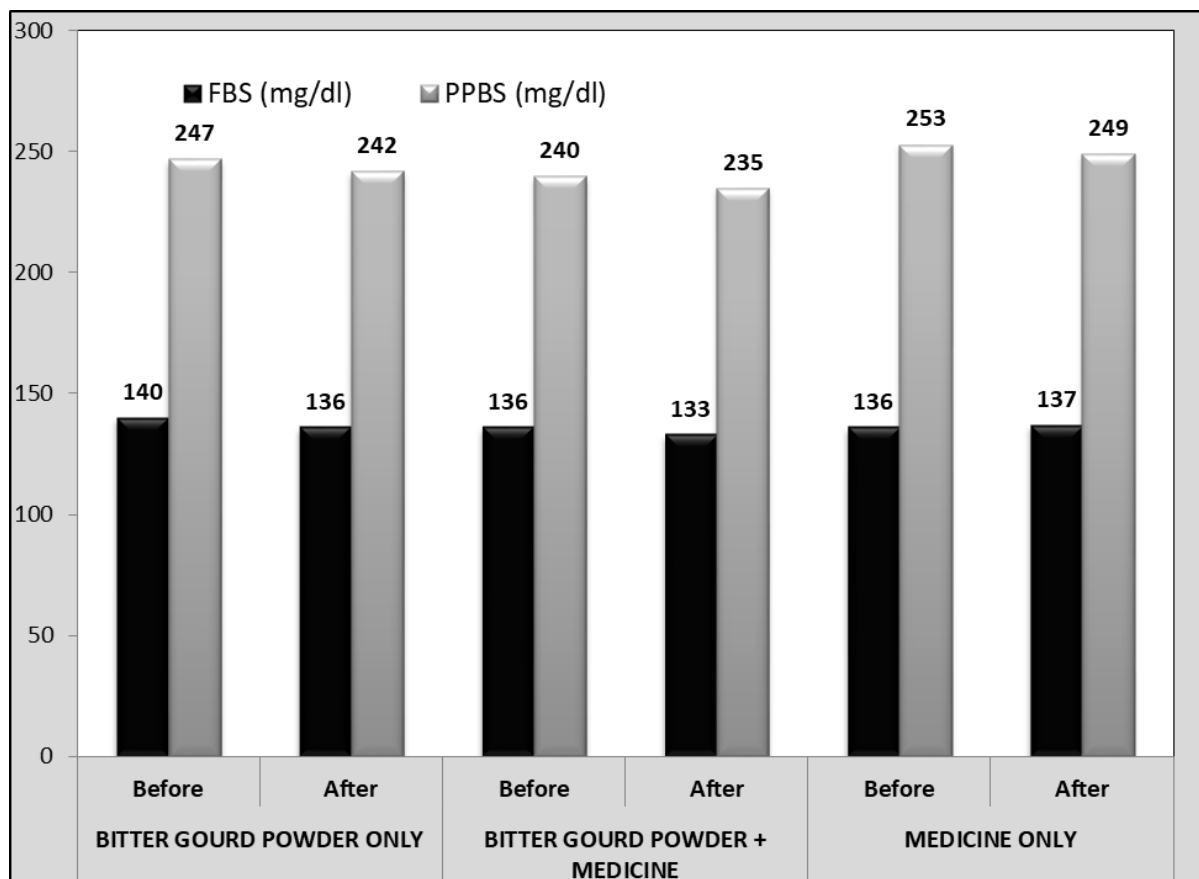


Figure 1: Blood Sugar Level of Subjects on Oral Administration