

Impact of Momordica Charantia (Karela) on the Proportion of Hepatocytes with Intranuclear Inclusions in the Streptozotocin-Induced Diabetic Rats

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Abstract

Background: Momordica charantia has some hypoglycemic properties. **Objective:** The purpose of the present study was to find out the impact of Momordica charantia (karela) on the proportion of hepatocytes in the Streptozotocin-induced diabetic rats. **Methodology:** This was an animal study carried out in the Department of Anatomy at Bangabandhu Sheikh Mujib Medical University (BSMMU) and Bangladesh Institute of Research & rehabilitation in Diabetes, Endocrine & metabolic Disorders (BIRDEM), Dhaka. Healthy young Long Evans rats of male sex weighing 150 to 280gm with an age range of 10 to 12 weeks were used in this study. The rats were divided into 4 equal groups depending upon their different sorts of dietary feedings and drug treatment. The variation of different proportion of hepatocytes with intranuclear inclusions in different groups of rat was monitored. **Result:** Sixty five rats were included in this study. Mean proportion of hepatocytes with intranuclear inclusions on day 51 from Streptozotocin/vehicle injection in the control group which was known as Group-A was 0. In untreated diabetic group the mean proportion of hepatocytes with intranuclear inclusions was 3.71 ± 0.82 . On the other hand, in the insulin-treated diabetic rats the mean proportion of hepatocytes with intranuclear inclusions was 0 and in the karela-treated diabetic rats, the proportion of hepatocytes with intranuclear inclusions was 0. The value in the insulin-treated diabetic rats ($p=0.0001$) and in the karela-treated diabetic rats ($p= 0.0001$) were significantly lower than that of the untreated diabetic rats; however, there was no significant difference between the insulin-treated diabetic rats & the karela-treated diabetic rats ($P>0.05$) in this regard. **Conclusion:** Karela showed a tendency of acting against hyperglycemic effects of Streptozotocin-induced diabetes mellitus and also acting against the rise in proportion of hepatocytes with intranuclear inclusions in Streptozotocin-induced diabetes mellitus. [J Shaheed Suhrawardy Med Coll, 2013;5(2):84-86]

Keywords: Diabetes mellitus, hyperglycemia, hepatocytes with intranuclear inclusions, momordica charantia, karela

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Introduction

Diabetes mellitus is major health problem in the years together¹. In Bangladesh a high proportion of diabetics are registered to different clinic and institutes, among which only Bangladesh Institute of Research and Rehabilitation in diabetes, Endocrine & Metabolic Disorders (BIRDEM), Dhaka. Although it is understandable that many of the diabetic patient especially in the rural area have not registered

themselves to any diabetic clinic or hospitals and many other still remain undiagnosed².

In the treatment of diabetes mellitus synthetic oral hypoglycaemics have various site effects and contraindications which have led to scientists to search for alternatives and many natural products indigenous to various parts of the world³. A large number of herbal products have

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been used as remedies of polyurea². Some of these are in the usual food list of the people concerned. Scientific studies also revealed the hypoglycaemic properties in many of these herbal products³. Among these herbal products *Momordica charantia* ('karela' or bitter ground) is one of such natural products which were cultivated in the many parts of Africa, South America as well as Asia.

Diabetes mellitus causes rise in the proportion of hepatocytes with intranuclear inclusions. This may indicate that 'karela' has antidiabetic role. This may also be used to minimize the rise in the proportion of hepatocytes with intranuclear inclusions in Streptozotocin-induced diabetes mellitus. The purpose of the present study was to find out the impact of *Momordica charantia* (karela) on the proportion of hepatocytes in the Streptozotocin-induced diabetic rats.

Methodology

This experiment was carried out on a total number of 65 young rats of male long Evans strain. They were 10 to 12 wks old, weighing between 150 and 280 gm. Among them 10 rats were treated with vehicle (citrate buffer solution 1 ml/ kg body weight intraperitoneally) only used as control rats (Group A) and 45 rats were treated with vehicle and Streptozotocin found as diabetes, 15 of which were treated as untreated diabetic control group (Group B), 15 were treated again with insulin at a dose of 1 - 3 units/ kg body weight / day, were treated as the insulin-treated diabetic group (Group C) and 15 were treated with karela at a dose of 10 ml/ kg body weight / per day orally through tube to control the diabetes mellitus and was called as 'karela'- treated diabetic group (Group D). In the Research Division of BIRDEM, Dhaka, the proportion of hepatocytes with intranuclear inclusions (per square mm) of liver section of all the rats, was estimated by a square on the slides which was standardized in such a way with a stage micrometer that it represented an area of 10,000 μm^2 in the tissue section under X100 oil immersion objective.

Results

The proportion of hepatocytes with intranuclear inclusions was estimated in all rats on day 51 from day of STZ/vehicle injection (Table 1). The proportion of hepatocytes with intranuclear inclusions was estimated in (per square mm) of liver section of all the rats. In control group the mean hepatocytes with intranuclear inclusions was 0 ± 0 . In untreated diabetic group the mean hepatocytes with intranuclear inclusions was 3.71 ± 0.82 . In insulin-treated diabetic rats the mean hepatocytes with intranuclear inclusions was 0 ± 0 . On the other hand, in the karela-treated diabetic rats the mean hepatocytes with intranuclear inclusions was 0 ± 0 . Statistical analyses also showed that the hepatocytes with intranuclear inclusions on day 51 from STZ injection were significantly lower in each of those two group, Group C & Group D, than in the untreated diabetic (Group B) ($p= 0.0001$ and $p= 0.0001$) respectively. However, there was no significant different between these two groups ($p>0.05$) in this regard.

Table 1: Proportion of Hepatocytes with Intranuclear Inclusions in Different Groups of Rats

Group	Hepatocytes with Intranuclear Inclusions (Mean \pm SD)
Group A (Control)	0
Group B (Untreated Diabetic)	3.71 \pm 0.82
Group C (Insulin-treated diabetic)	0
Group D ('Karela'-treated diabetic)	0

*Statistical analyses for significance of differences between different groups through Student 't' test. Group B vs A: $P= 0.0001$; group C vs B : $P= 0.0001$; group D vs B : $P= 0.0001$; group C vs D : $P>0.05$

Discussion

Karela is very popular as a vegetable in Bangladesh. In Sri-Lanka the fruit juice of *M. charantia* is considered as an effective hypoglycemic agent in management of diabetes mellitus⁴. In the other parts of the world it is used as the folk medicine to the treatment of diabetes¹. 'Karela's hypoglycemic property has also been shown experimentally in the diabetics as well as in normal laboratory animals⁵.

Momordica charantia Linn. (Karela) commonly known as bitter melon or bitter gourd is tropical and subtropical climber of the family Cucurbitaceae. It is widely distributed in China, Malaysia, India and tropical Africa. The Latin name *Momordica* means "to bite" (referring to the jagged edges of the leaf, which appear as if they have been bitten). All parts of the plant, including the fruit taste very bitter¹, as it contains a bitter compound called momordicin that is believed to have a stomachic effect². In Ayurveda, various parts of *Momordica charantia* (Karela) are recommended for many diseases like; cholera, bronchitis, anemia, blood diseases, ulcer, diarrhea, dysentery, sexual tonic and as a cure for gonorrhoea³. Karela contains an array of biologically active plant chemicals including triterpens, proteins, steroids, alkaloids, saponins, flavonoids and acids due to which plant possesses anti-fungal, anti-bacterial, anti-parasitic, anti-viral, anti-fertility, anti-tumor, hypoglycemic and anti-carcinogenic properties⁴⁻⁸. Fruits are used as traditional medication to cure various diseases like rheumatism, gout, worms, colic, disease of liver and spleen⁹. It is also found useful in the treatment of cancer and diabetes¹⁰. It is a potent hypoglycemic agent due to alkaloids and insulin like peptides and a mixture of steroidal sapogenins known as charantin¹¹.

Untreated diabetic rats showed the significant higher hepatocytes with intranuclear inclusions than the control rats. Enlargement of the hepatocytes with intranuclear inclusions along with higher hepatocytes with intranuclear inclusions has been found to be a feature of experimentally induced diabetic rats⁶.

The hepatocytes with intranuclear inclusions decrease by the treatment with *Momordica charantia* (karela) of all the diabetic rats. The hepatocytes with intranuclear inclusions in insulin-treated and karela-treated diabetic rats were

significantly lower than that in the untreated diabetic rats. This impact was similar to that of the effect of insulin on STZ - induced diabetic rats¹. Similar findings were also observed by another study⁶. Doi et al³ found the higher hepatocytes with intranuclear inclusions in STZ induced diabetic rats than that in the control mice. In case of diabetes mellitus hepatocytes with intranuclear inclusions are increased and thus hepatocytes with intranuclear inclusions may be an important landmark to detect the diabetic status⁶⁻⁷.

Conclusion

Momordica charantia (karela) showed a tendency of lowering the higher proportion of hepatocytes with intranuclear inclusions in diabetes mellitus. However further investigations are recommended for establishing the active ingredient(s) of karela as a safe, useful and effective hepatocytes with intranuclear inclusions-lowering agent in diabetes mellitus as well as the anti-hyperglycaemic agent.

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