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Impact of *Momordica charantia* (karela) on serum alanine aminotransferase level in streptozotocin induced diabetic rats

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Abstract

The present experimental study was conducted at Department of Anatomy in BSMMU (Bangabandhu Sheikh Mujib Medical University) & BIRDEM (Bangladesh Institute of Research & rehabilitation in Diabetes, Endocrine & metabolic Disorders) to investigate whether Momordica charantia (karela) has got any impact on serum alanine aminotransferase (ALT) level in the streptozotocin-induced diabetic rats. Sixty healthy young Long Evans rats of male sex weighing 150 to 280 gm aged between 10 to 12 weeks were used in this study. The rats were divided into 4 equal groups depending on their different sorts of dietary feedings and drug treatment. The final ALT level (on 51st day) ranged from 23 to 34 u/L (mean 30.10 u/L) in healthy rats, 56 to 80 u/L (mean 68.50 u/L) in the untreated diabetic rats, 36 o 37 u/L (mean 31.50 u/L) in the insulin-treated diabetic rats and 61 to 96 u/L (mean 81.10 u/L) in the karela-treated diabetic rats. The ALT percentage change value of diabetic rats on 51st day corresponding to the initial on 7th day was significantly higher than that healthy rats (p<0.001). The value in the insulin-treated diabetic rats was significantly lower than that of the untreated diabetic rats (p<0.001) & the karela-treated diabetic rats (p<0.001). There was no significant difference between the values of the untreated diabetic rats & the karela-treated diabetic rats (p>0.05). The present study did not show that karela has any significant impact of acting against higher serum ALT level in streptozotocin-induced diabetes mellitus. Further investigation is recommended for establishing karela as an agent against higher serum ALT level in diabetes mellitus.

Key words: *Diabetes mellitus, Serum alanine aminotransferase, Momordica charantia (karela)*

Introduction

Diabetes mellitus is one of the major diseases for morbidity and mortality throughout the world. According to the recent study the prevalence of diabetes mellitus is 8.3% worldwide and that indicates 382 million people are affected.[1] Diabetes mellitus is one of the most common endocrine disorders and a major global health problem today. Main feature of

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diabetes mellitus is chronic hyperglycemia as a result of a relative or absolute lack of insulin or the actions of insulin on the target tissues or both.[2]

Although it is understandable that many of the diabetic patient especially in the rural area have not registered themselves to any diabetic clinic or hospital and many other still remain undiagnosed. A large number of herbal products have been recommended for the treatment of diabetes. The ethno botanical information reports that 800 plants may have anti-diabetic activities. Among these herbal products *Momordica charantia* (karela or bitter gourd) is one of such natural products, cultivated in the many parts of Africa, South America and Asia, the fruit is very popular as a vegetable in Bangladesh. In Sri Lanka the fruit juice of karela is considered as an effective hypoglycemic agent in management of diabetes mellitus. In the other parts of the world it is used as the folk medicine to the treatment of diabetes.[3] Karela's hypoglycemic property has also been shown experimentally in the diabetics as well as in normal laboratory animals.[4-6] Effect of long term feeding (10 weeks) of karela fruit extract showed hypoglycemic properties in streptozotocin induced diabetic rats. Karela reduces the volume of the liver and reduces the blood sugar levels.[7] Karela reduces weight of the liver and body fat without affecting energy intake and apparent fat absorption in rats fed with a high fat diet.[8-11]

As because diabetes mellitus causes rise in fasting blood glucose level, it may be hypothesized that karela being an anti-diabetic agent, may also be used to minimize the rise of the serum alanine aminotransferase (ALT) level in streptozotocin-induced diabetic rats. Thus the aim of the present study was to determine whether karela has any impact on ALT level in streptozotocin-induced diabetic rats.

Methods

The experiment was carried out on a total number of 60 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/day intra-peritoneal) only used as healthy rats (Group A) and 45 rats were treated with vehicle and streptozotocin found as diabetic, 15 of which were as untreated diabetic control group (Group B), 15 were treated with insulin at a dose of 1-3 units/kg-body-weight/day and marked as insulin-treated diabetic group (Group C) and 15 were treated with karela at a dose of 10 ml/kg-body-weight/day orally through a tube was called as karela- treated diabetic group (Group D).

The ALT was estimated on day 7 and on day 51 in the Research Division of BIRDEM, Dhaka. In this method for sample and blank, one test tube for each was taken and 1 ml of ALT buffer reagent was taken in each test tube. Serum (0.2 ml) was added to the sample tube and redistilled water (0.2 ml) was added to the blank tube. Both of the test tubes were placed in water bath at 37°C for 30 minutes. After that period, the test tubes were taken out and 1 ml of detection reagent was added to each tube and kept at room temperature for further 20 minutes. Then 10 ml of 0.4 N sodium hydroxide solutions was added to each test tube. After 6 minutes, reading was taken from colorimeter at wavelength 340-365 nm.

Results

Serum ALT level was estimated in all rats on day 51 from day of streptozotocin/vehicle injection shown in Table 1. The final ALT level (on 51st day) ranged from 23 to 34 u/L (mean 30.10 u/L) in healthy rats, 56 to 80 u/L (mean 68.50 u/L) in the untreated diabetic rats, 36 o 37 u/L (mean 31.50 u/L) in the insulin-treated diabetic rats and 61 to 96 u/L (mean 81.10 u/L) in the karela-treated diabetic rats. The ALT percentage change value of diabetic rats on 51st day corresponding to the initial on 7th day was significantly higher than that healthy rats ($p<0.001$). The value in the insulin-treated diabetic rats was significantly lower than that

Table 1. Serum alanine amino transferase (ALT) level in different groups of rats (n=15 in each group)

Group	Serum ALT Level (u/L)		
	Initial level (on day 7) Mean±SD	Final level (on day 51) Mean±SD	Final level as % of initial level Mean±SD
A (Healthy group)	31.90±2.73	30.10±3.78	95.40±16.35
B (Untreated diabetic)	53.60±9.42	68.50±8.09	129.67±17.66*
C (Insulin-treated diabetic)	52.80±4.57	31.50±3.66	59.74±5.69#
D (Karela-treated diabetic)	67.80±9.93	81.10±12.37	121.18±21.75$

*: Group A vs Group B ($p<0.001$); #: Group B vs Group C ($p<0.001$); $: Group B vs Group D ($p>0.05$) by Student's t-test.

of the untreated diabetic rats ($p<0.001$) and the karela-treated diabetic rats ($p<0.001$). There was no significant difference between the values of the untreated diabetic rats and the karela-treated diabetic rats ($p>0.05$).

Discussion

Untreated diabetic rats showed a significant rise serum ALT level than the healthy rats. Higher serum ALT level has been found to be a feature of experimentally induced diabetic rats. The higher serum ALT level of the diabetic rats was decreased by the treatment with insulin. The decrease in serum ALT level was significantly higher in insulin treated diabetic rats than that in the untreated diabetic rats. There was no significant difference in the decrease of ALT between the untreated diabetic rats and the karela treated diabetic rats in this regard. However, in other study it was found that the serum ALT level in karela treated diabetic rats was significantly lower than that in the untreated diabetic rats and this impact was similar to that of the effect of insulin on streptozotocin- induced diabetic rats.[3] Doi et al. found the higher serum ALT level in streptozotocin-induced diabetic rats than that in the control mice.[3] In case of diabetes mellitus serum ALT level are increased and thus serum ALT level may be an important landmark to detect the diabetic status.[5,6] However, the present study did not show that karela has any ALT level lowering effect. The reason may be that the other study was conducted on male Sprague-Dawley rats instead of male Long Evans strain.

Conclusion

Karela did not show a tendency of lowering the rise serum ALT level in diabetes mellitus. Further investigations are recommended for establishing the active ingredient(s) of karela as a safe, useful and effective agent against the rise in serum ALT level and as well as an anti-hyperglycemic agent.

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