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IMPACT OF MOMORDICA CHARANTIA (KARELA) ON THE SERUM ALKALINE PHOSPHATASE (ALP) LEVEL IN THE STREPTOZOTOCIN-INDUCED DIABETIC RATS.

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ABSTRACT

Objective: Scientific studies revealed hypoglycemic properties of Momordica charantia (karela). The study was carried out to find out Momordica charantia (karela) has lowering effect of serum alkaline phosphatase (ALP) level in the Streptozotocin-induced diabetic rats. **Study type:** An experimental study. **Setting:** Anatomy department of BSMMU(Bangabandhu Sheikh Mujib Medical University) & BIRDEM (Bangladesh Institute of Research & Rehabilitation in Diabetes, Endocrine & Metabolic Disorders). **Subjects:** Sixty Five healthy young male rats of Long Evans strain weighing 150 to 280gms aged 10 to 12 weeks were used in this study. **Methods:** The rats were divided into 4 equal groups depending upon their different sorts of dietary feedings & drug treatment. **Main outcome:** Variation of serum alkaline phosphatase (ALP) level in different groups of rat. **Result:** Mean 'initial' and 'final' (on day 7 and day 51 from Streptozotocin/vehicle injection) serum alkaline phosphatase (ALP) level in the control group (Group-A) Mean ± SD was 160.40 ± 43.53 u//L and 113.10 ± 34.94 u//L respectively. Therefore, the mean ALP level decreased (P = 0.022*) which is lower than that of the initial value. In untreated diabetic group the mean ALP level Mean ± SD was 323.20 ± 35.27 u//L and the mean final Mean ± SD was 345.30 ± 31.96 u//L. So here, the ALP level increased (P = 0.557). On the other hand, in the insulin-treated diabetic rats the mean initial ALP level Mean ± SD was 477.60 ± 243.40 u//L and the mean final Mean ± SD was 187.20 ± 88.76 u//L, which is lower (P = 0.000*) & in the karela-treated diabetic rats, the initial ALP level Mean ± SD was 402.00 ± 214.78 u//L and the mean final Mean ± SD was 351.00 ± 71.37 u//L which is also lower (P = 0.000*). The value in the untreated diabetic group was significantly higher than that in the control group (P=0.000*). On the other hand, the value in the insulin-treated diabetic group was significantly lower than that of the untreated diabetic rats (P = 0.000*). But the value in the karela-treated diabetic group showed comparatively lesser effect than insulin in lowering ALP level.**Conclusion:** Karela showed a tendency of acting against hyperglycemic effects of Streptozotocin-induced diabetes mellitus and there was significant decrease alkaline phosphatase (ALP) level in Streptozotocin-induced diabetes mellitus. However, further investigations are recommended for establishing karela as a safe, useful effective anti-hyperglycemic agent as well as an agent may act against the rise in serum alkaline phosphatase (ALP) level by Streptozotocin-induced diabetes mellitus.

INTRODUCTION

In the years together, diabetes mellitus is major health problem. 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) has registered in 1998, 1,93,271 cases which is higher than that of previous year. 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 undiagnosed.

In the treatment of diabetes mellitus synthetic oral hypoglycaemics have various side effects & contraindications. This has led to scientists to search for alternatives and many natural products indigenous to various parts of the world. A large number of herbal products have been used as remedies of polyurea. 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 products. Among these herbal products Momordica charantia ('karela' or bitter ground) is one of such natural products, cultivated in the

Key words: Diabetes mellitus, Hyperglycemia, Serum alkaline phosphatase (ALP) level, Momordica charantia (karela).

many parts of Africa, South America & Asia. The fruit 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 mellitus. 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 animals[2,3,4,5].

As because diabetes mellitus causes rise in serum alkaline phosphatase (ALP) level it may be hypothesized that 'karela' (bitter ground) being an antidiabetic agent, may also be used to minimize the high serum alkaline phosphatase (ALP) level by removing the toxins in the karela in Streptozotocin-induced diabetes mellitus.

MATERIAL AND METHODS

The experiment was carried out with a total number of 65 young male rats of Long Evans strain. They were 10 to 12 wks old, weighing 150 and 280gm. Among them 10 rats were treated with vehicle (citrate buffer solution 1 ml/ kg body weight intraperitoneally) serves as control group (Group A). Forty five rats were treated with vehicle and Streptozotocin found as diabetics and acted as experimental group, 0ut of 55, ten rats with blood glucose more than 10 mmol were excluded from the experiment on the day 7, remaining 45 diabetic rats were divided into three groups.15 of which were treated as untreated diabetic 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) & 15 were treated with karela FRUIT JUICE at a dose of 10 ml/ kg body weight per day orally through the tube and was called as 'karela'- treated diabetic group (Group D).

In the Research Division of BIRDEM, Dhaka, the AST was estimated on day 7 and on day 51. In this method for sample and blank, one test tube for each was taken and one ml of ALP buffer reagent was taken in each test tube. 0.2 ml of serum was added to the sample tube. 0.2 ml of redistilled water was added to the blank tube. Both of the test tubes were placed in the water bath at 37¡C for 30 minutes. After that period, the test tube was taken and 1 ml of 2,4-dinitrophenyl hydrazine 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.

OBSERVATIONS AND RESULTS

Serum alkaline phosphatase (ALP) level was estimated in all rats on day 51 from day of STZ/vehicle injection shown in Table- I & Figure- I.

Table I : Serum ALP level in different groups of rats (n in each group)

Group	Serum ALP level (u/L)		
	Initial (on day 7) Mean–SD	Final level (on day 51) Mean–SD	Final serum ALP level as a percentage (%) of corresponding initial level Mean–SD
A(n=10) (Control	160.40–43.53	113.10–34.94	72.65–21.25
B(n=15) (Untreated Diabetic)	323.20–35.27	345.30–31.96	107.28–8.74
C(n=15) (Insulin-treated diabetic)	477.30–243.40	187.20–88.76	48.19–23.44
D(n=15) ('Karela'-treated diabetic)	402.00–214.78	351.00–71.37	121.22–77.57

Statistical analyses for significance of differences between different groups:

Final serum ALP levels as a percentage (%) of corresponding initial level compared through unpaired Student's't' test:

Group B vs A : P= 0.000*
C vs B : P= 0.000*
D vs B : P= 0.586
C vs D : P= 0.016*

*Significant at 5% level (P † 0.05)

Mean – SD of serum alkaline phosphatase (ALP) level (on day 51 from Streptozotocin/vehicle injection) was 113.10 – 34.94 u//L & the mean final serum ALP level as a percentage of corresponding initial level was 72.65 – 21.25 u//L in the control group (Group-A). In untreated diabetic group the Mean – SD, serum ALP level was 345.30 – 31.96 u//L & the mean final serum ALP level as a percentage of corresponding initial level was 107.28 – 21.25 u//L. On the other hand, in the insulin-treated diabetic rats the Mean – SD, serum ALP level was 187.20 – 88.76 u//L and the mean final serum ALP level as a percentage of corresponding initial level was 48.19 –

23.44 u//L & in the karela-treated diabetic rats, Mean – SD, serum ALP level was 402.00 – 214.78 u//L and the mean final serum ALP level as a percentage of corresponding initial level was 121.22 – 77.57 u//L.

Statistical analyses also showed that the serum alkaline phosphatase (ALP) level on day 51from STZ injection, in the insulin-treated diabetic group were significantly lower than that of the untreated diabetic group (P= 0.000*) & in the karela treated diabetic rats, the result in group D were higher than that in the group B (P = 0.586). But there was also significant difference between the insulin-treated diabetic group & the karela-treated diabetic group (P = 0.016*) in this regard.

DISCUSSION

Regarding the serum levels of enzyme related to the liver, ALP (serum alkaline phosphatase (ALP), increased levels are characteristic of STZ-induced diabetes (as observed by Kume et. Al 1994). Similar was the findings in the present study. Insulin treatment brought about a significantly lower level in the STZ-induced diabetic rats than when they were left untreated. However, karela-treatment could not bring any beneficial result. The mean values of ALP were higher than without treatment, but the difference was not significant (P=0.586). 'Karela'-treatment has been shown to raise ALP (Tennekoon et al. 1994). Similar findings were also found Doi et al. (1997)1 that the higher serum ALP level in STZ-induced diabetic rats than that in the control mice.

The authors suspect that this finding may suggest that 'karela' may contain some hepatotoxins that may cause hepatocellular damage at a molecular level without causing significant histopathological changes.

The serum ALP level may be decreased by the treatment with Momordica charantia ('karela') of all the diabetic rats by removing the toxins in the 'karela'. The decrease in the serum ALP level in group C were significantly lower (P= 0.000*) than that of the untreated diabetic rats, but there was nonsignificantly difference between the diabetic rats and the 'karela'-treated diabetic rats in this regard (P= 0.586). In case of diabetes mellitus serum ALP level are increased and thus serum ALP level may be an important landmark to detect the diabetic status[6,7].

CONCLUSION

Momordica charantia (karela) showed a tendency of decreasing in serum alkaline phosphatase (ALP) level in diabetes mellitus. However, further investigations are recommended for establishing the active ingredient(s) of karela as a safe, useful and effective antihyperglycaemic agent as well as an agent against the increase in serum ALP level in diabetes mellitus.

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