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Background and objectives: With continued efforts to find solutions to rising rates of obesity and diabetes, there is increased interest in the potential health benefits of the use of low- and no-calorie sweeteners. Aspartame is one of the most popular artificial sweeteners over the world. However, there are still many concerns about its safety. This study compares the effect of aspartame consumption alone and combined with vitamins C and E over biochemical parameters related to liver and kidney functions and oxidative stress biomarkers.

Materials and Methods:

Animals:

Male Wistar rats (3-4 months), weighing 250-325g were purchased from the animal house of the College of Veterinary Medicine, University of Dohuk. These animals were kept in ventilated cages at controlled temperature (22 °C ± 2) and cycles of light and dark. Food and water were given ad libitum. Rats handling and treatment were according to guidelines for laboratory animal care and use protocols. Approval of this experimental protocol had been taken from the animal Ethics Committee of the College of Veterinary Medicine.

Experimental Design

5 groups of rats - Control I: treated with drinking water. Control II: 0.2 ml of olive oil (vehicle for vitamin E). Experimental Groups - Group I: aspartame (40 mg/Kg). Group II: aspartame (40 mg/Kg) plus vitamin C (150 mg/Kg). Group III: aspartame (40 mg/Kg) plus vitamin E (100 mg/Kg). All the treatments were administered by gavage once a day during 60 days.

Statistical analysis

All data were analyzed by one-way analysis of variance (ANOVA). The Duncan multiple range test was used to detect specific differences between the groups.

Samples collection

Blood samples were collected at zero time and after 60 days from the orbital plexus vein. The serum was separated and used for the measurement of the biochemical parameters. Liver and brain tissue were removed after 60 days and used for the assay of catalase activity and determination of 8-OHdG level. Urine samples were collected at zero time and after 60 days of treatment for assay of isoprostane concentration.

Results:

Aspartame combined with vitamins C or E led to a decrease on body weight of 7% and 10%, respectively. Total cholesterol concentration was decreased when aspartame was combined with vitamin C (7%) or E (20%). AST activity was increased by aspartame which was prevented when its consumption was combined with vitamins C or E. ALT activity was decreased in presence of vitamin C (40%) or E (36%) (Figure 1). Aspartame with vitamin C or E decreased the level of creatinine 31% and 30%, respectively. Combination with Vitamin E decreased catalase activity (31%) when compared to ASP. ASP led to an increase on 8-OHdG concentration (18%) when compared to the control. The increase on 8-OHdG was reduced by 12% and 2% when ASP was combined with vitamin C or E, respectively. ASP increased isoprostane concentration 239%, but when combined with vitamin C or E the observed increase was 214% and 169% respectively.

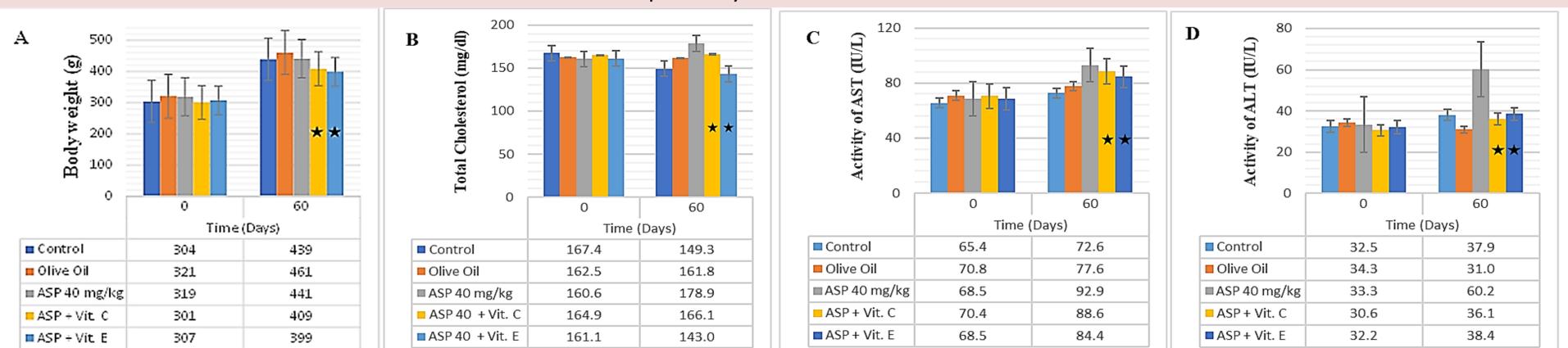


Figure 1: Effect of aspartame (ASP) administration (40 mg/kg b.w.) in rats (n= 12-15) alone and when combined with Vitamin C (Vit. C; 150 mg/kg b.w.) or Vitamin E (Vit. E; 100 mg/kg b.w.) on: A- Body weight, B- Total cholesterol, C- Aspartate transaminase activity (AST), D- Alanine aminotransferase activity (ALT), at 0 time and after 60 days. The values were expressed as mean ± SEM. Significant differences (*) were considered at P<0.05 compared to control.

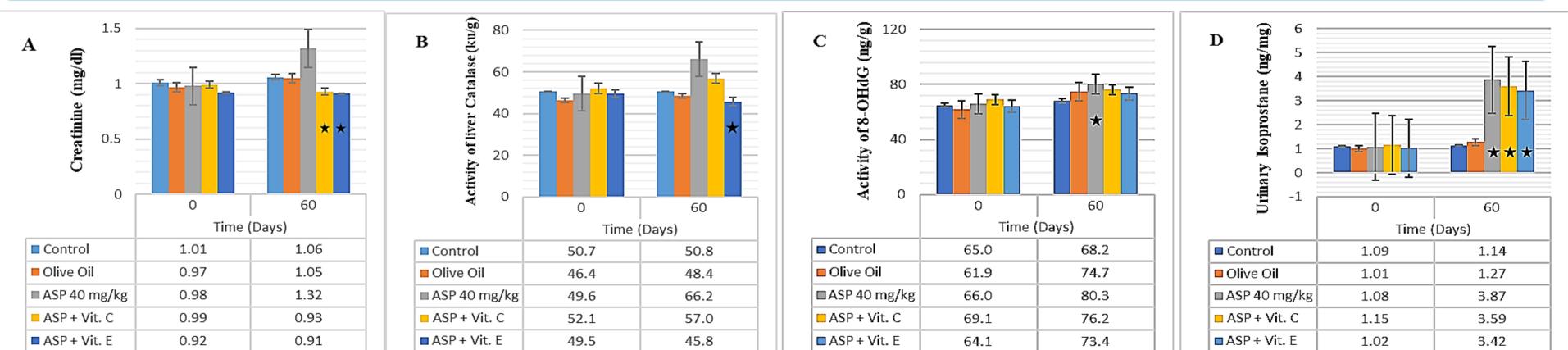


Figure 2: Effect of aspartame (ASP) administration (40 mg/kg b.w.) in rats (n= 12-15) alone, and when combined with Vitamin C (Vit. C; 150 mg/kg b.w.) or Vitamin E (Vit. E; 100 mg/kg b.w.) on: A- Creatinine, B- Catalase activity, C- 8-OHdG concentration, and D- Urinary Isoprostane concentration at 0 time and after 60 days. The values are expressed as mean ± SEM. Significant differences (*) were considered at P<0.05 compared to control.

Conclusion: The results obtained in the present study suggest that combining vitamin C or E with the administration of aspartame has a protective effect over liver and kidney functions as well as a protective effect against oxidative stress.

