

Effect of Aquatic Seed Extract of (*Cichorium intybus* L.) and Metformin on Nitric Oxide in Type 2 Diabetic Rats

Authors : Lotfollah Rezagholizadeh

Abstract : Background and Aim: Diabetes mellitus is related to high mortality and morbidity caused by the early development of atherosclerosis correlated to diabetic macroangiopathy. The endothelium-derived vasodilator, nitric oxide (NO) has been implicated in the development of vascular complications via the regulation of blood flow, and various antiatherosclerotic actions. Patients with type 2 diabetes (T2D) have a decreased level of endothelial nitric oxide release. In this study we aimed to examine the effect of aquatic seed extract of *Cichorium intybus* L. (chicory) and metformin (a known prescription drug for diabetes) on NO levels in T2D rats. Methods: Five groups of adult male Wistar rats were used (n=6): Non-diabetic controls without extract treatment (Control), Non-diabetic controls with extract treatment (Chicory-control), T2D rats without extract treatment (NIA/STZ), T2D rats treated with the extract (Chicory-NIA/STZ), and T2D groups that received metformin (100 mg/kg) but no extract (Metformin-NIA/STZ). T2D was induced with intraperitoneal (i.p) injection of niacinamide (NIA, 200 mg/kg), 15 min after an i.p administration of streptozotocin (STZ, 55 mg/kg). Lyophilized chicory extract (125 mg/kg) was dissolved in 0.2 ml normal saline and administered one dose a day. The experiments lasted for 3 weeks after the diabetes induction. NO analysis was performed by assay based on the Griess reaction. Data were reported as the mean \pm SD and statistical analysis was performed by ANOVA. Results: Serum nitric oxide levels decreased significantly in NIA/STZ group compared with Control and Chicory-control. Treatment with chicory extract caused a significant increase in serum levels of NO in Chicory-NIA/STZ group compare to NIA/STZ group ($p<05$). Metformin-NIA/STZ group did not show considerable difference when compared with NIA/STZ, with respect to NO levels. In a group of rats made diabetic by STZ alone (type 1 diabetic rats, T1D), chicory did not have a significant ameliorating effect. Conclusion: In this study, we clearly showed a relationship between low serum nitric oxide levels and diabetes mellitus in rats. The increase in serum nitric oxide by chicory extract is an indication of antiatherogenic effect of this plant. Chicory seed extract was more efficient than metformin in improving the NO levels in NO-deficient T2D diabetic rats.

Keywords : type 2 diabetes mellitus, nitric oxide, chicory, metformin

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