Effect of dragon fruit extract on oxidative stress and aortic stiffness in streptozotocin-induced diabetes in rats

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Submitted: 14-11-2009 Revised: 26-01-2010 Published: 13-03-2010

ABSTRACT

Cardiovascular complications are consistently observed in diabetic patients across all age groups. The objective of the present study was to investigate the effect of aqueous extract of the fruit pulp of Hylocereus undatus (DFE) on aortic stiffness and oxidative stress in streptozotocin (STZ)-induced diabetes in rats. Twenty-four male, Sprague-Dawley rats were randomized into four groups: I (control), II (diabetic), III (DFE, 250 mg/kg) and IV (DFE 500 mg/kg). Diabetes was induced in groups II, III and IV by intraperitoneal i.p. injection of STZ (40 mg/kg). After confirmation of diabetes, group III and IV received DFE for 5 weeks. Pulse wave velocity (PWV) was used as a marker of aortic stiffness and was determined at the end of 6 weeks. DFE significantly decreased (P < 0.05) the fasting blood glucose levels in diabetic rats, but not to normal levels. Systolic blood pressure, pulse pressure and PWV were significantly increased (P < 0.05) in diabetic rats at the end of 6 weeks in comparison with control group. DFE treatment significantly decreased (P < 0.05) these elevations. Oxidative damage was observed in group II after 5 weeks. Plasma malondialdehyde levels significantly decreased (P < 0.05), while superoxide dismutase and total antioxidant capacity significantly increased (P < 0.05) with DFE treatment in comparison with group II. These data demonstrate that DFE treatment was effective in controlling oxidative damage and decreasing the aortic stiffness measured by PWV in STZ-induced diabetes in rats.

Key words: Aortic stiffness, diabetes, Hylocereus undatus, pulse wave velocity, streptozotocin

INTRODUCTION

Cardiovascular disease is the major cause of mortality in the western world and accounts for up to a third of all deaths worldwide. Most of these deaths occurred in low- and middle-income countries. It is estimated to be the leading cause of death in developing countries by 2020. Aortic stiffness is predictive of adverse cardiovascular events, in a range of subpopulations and different disease types. Aortic stiffness can be determined by measuring the pulse wave velocity (PWV). Pulse wave travels faster in a stiffer vessel. Hence PWV has been widely used as a surrogate marker for arterial stiffness and vascular diseases. Association of higher cardiovascular risk with increased pulse wave velocity was demonstrated in 110 hypertensive subjects. Cardiovascular complications are observed in both type 1 and type 2 diabetic patients. Diabetes increases the risk of vascular complications at least by (low). Macrovacular disease (cerebrovascular, coronary artery and peripheral vascular disease) is the cause of death in 70% to 80% of diabetic patients. Impairment in contractile function of the vascular smooth muscle cells is observed in rats treated with streptozotocin (STZ), which may be because of changes in vasoactive substances and vasoconstrictor responsiveness. The mechanical properties of the arterial system in STZ-diabetic rats may be altered by changes in cellularity of the diabetic conducting arteries. Oxidative stress plays an important role in the development of vascular complications associated with diabetes. Antioxidants have been reported to have beneficial effects in cardiovascular diseases associated with overproduction of reactive oxygen species.

Polyphenolics, carotenoids, thios, tocopherol and