The effects of *Trigonella foenum-graecum* seed extract and metformin on vascular oxidative stress, eNOS and VCAM-1 genes expression in STZ-induced diabetic rat aorta

**Background:** Diabetes mellitus is a chronic metabolic disease characterized by increased level of blood glucose resulting from lack of insulin or insulin resistance in peripheral tissues or both. According to the forecasts, its prevalence will increase in the future. Diabetes is an important risk factor for cardiovascular diseases. Oxidative stress plays a pivotal role in the development of diabetes complications. The high percent of morbidity in diabetic patients is caused by endothelial dysfunction. *Trigonella foenum-graecum* (*T. foenum*) is one of traditional herbal medicines which have been used for decades to treat diabetes. *T. foenum* is a plant belonged to the Fabaceae family that has many pharmacological properties such as: antidiabetic, antihyperlipidemic, anti-inflammatory and antioxidant effects. The present study investigated the effects of *T. foenum seed extract* and metformin on vascular oxidative stress, eNOS and VCAM-1 genes expression in streptozotocin (STZ)-induced diabetic rat aorta.

**Methods:** This study was conducted using 60 male Wistar rats (250 – 300 g). Rats were divided into six experimental groups (control, untreated STZ-induced diabetic, metformin, and three groups of *T. foenum* extract). Treated rats received *T. foenum* extract (50, 100 and 200 mg/kg) or metformin (300 mg/kg) daily by gavage for 6 weeks. Fasting serum levels of glucose, cholesterol and triglyceride were measured on days zero, 24 and 45 of the experiment. Malondialdehyde (MDA), total thiol levels and also the activities of superoxide dismutase and catalase were assessed. The eNOS and VCAM-1 genes expression in aortic tissues were evaluated in all involved groups.

**Results:** The results showed that serum glucose levels in diabetic group was significantly higher compare to control group (*P*<0.001). glucose levels in metformin, Fen 50 and Fen100 groups were significantly lowered than diabetic group (*P*<0.001). Serum levels of cholesterol and triglycerides were significantly decreased in metformin, Fen 100, and Fen 200 groups on day 45 compared to the diabetic group (*P*<0.001 to *P*<0.05). In all treated groups, the MDA levels were lower than diabetic group (*P*<0.001). Total thiol levels were increased in aortic tissue of all treated groups compared to diabetic group (*P*<0.001 to *P*<0.001). The activities of superoxide dismutase in aortic tissues of metformin, Fen 100 and Fen 200 groups were higher than diabetic groups (*P*<0.001 to *P*<0.05). The activities of catalase in aortic tissues of metformin, Fen 100, and Fen 200 groups were higher than diabetic groups (*P*<0.001 to *P*<0.001).

In aortic tissues of untreated diabetic group eNOS gene expression was reduced while VCAM-1 gene expression increased (*P*<0.01) in comparison to control group. The expressions of eNOS gene in metformin and Fen50 groups were significantly increased compared to the untreated diabetic group (*P*<0.05). The expression of VCAM-1 gene in metformin, Fen100, and Fen 200 groups significantly decreased in comparison to untreated diabetic group (*P*<0.05, *P*<0.01).

**Conclusion:** The results showed that administration of hydro alcoholic extract of *T. foenum* for 6 week could decrease hyperglycemia; hyperlipidemia and oxidative stress in aortic tissue and also improved endothelial dysfunction by regulating eNOS and VCAM-1 genes expression in STZ-induced diabetic rat aorta.

**Key words:** Diabetes, *Trigonella foenum-graecum* seed, Endothelial dysfunction, Oxidative stress, Rat, eNOS, VCAM-1