Protective Effects of Vitamin C against Nicotine-Induced Oxidative Damage of Rat Liver and Kidney

Ghada S Mahmoud, Ayman S Amer

Abstract:

Objective: Vitamin C is a vital antioxidant that may antagonize deleterious effects of smoking. The aim of this study was to evaluate the effects of administration of nicotine alone for three weeks or combined with vitamin C on the antioxidant defense status, functional, histopathological changes, and immunohistochemical demonstration of proliferating cell nuclear antigen (PCNA) in rat liver and kidney tissues. Methods: Animals were divided into four groups; (C) saline-treated, (VC) vitamin C-treated, (NIC) nicotine-treated, all were for 3 weeks, and (NIC+VC) is given vitamin C for 3 days prior, with nicotine injection and 2 days thereafter. Results: Present work showed that nicotine exposure caused significant reduction in total body weight, relative liver and kidney weights, elevated malondialdehyde (MDA), alanine transaminase (ALT), aspartate transaminase (AST), and alkaline phosphatase (ALP) in both hepatic and renal tissues. Co-exposure to nicotine and vitamin C maintained normal liver and kidney weight, significantly lowered MDA, ALT, AST, ALP and elevated glutathione in both hepatic and renal tissues compared NIC group as well as controls. Nicotine administration resulted in shedding, necrosis, and loss of brush border of cells covering proximal and distal convoluted tubules of kidney. The liver in the nicotine-treated group showed vacuolated cytoplasm of hepatocytes, with dilated central vein and sinusoids and mitochondrial destruction. Immunohistochemistry showed dense PCNA immunostaining in the livers of nicotine-treated rats. Vitamin C induced partial correction of nicotine-induced histopathological damage of liver and kidney and significant elevation in PCNA expression. Conclusion: The results of present work suggested that vitamin C has a promising prophylactic effect against nicotine-induced oxidative damage of liver and kidney.

Keywords:
Nicotine, Vitamin C, Ascorbic acid, Liver, Kidney, Histopathology, Glutathione (GSH), Malondialdehyde (MDA), Lipid peroxidation, Oxidative stress, Immunohistochemistry

Published In:

IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT), 8(12), 50-63