

Pomegranate peels ameliorate renal nitric oxide synthase, interleukin-1 β , and kidney injury molecule-1 in nephrotoxicity induced by acrylamide in rats

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Background and objectives

Acrylamide (AA) is considered a toxic intermediate product of the Millard reaction and liberated in high-carbohydrate foods exposed to high temperatures. AA formed during baking, frying, roasting, or grilling of such food. Various studies have recorded the toxic effects of AA on many biological functions. The aim of our study is to determine such toxic effect on the kidney and the prophylactic role of pomegranate peels (PP) as a waste portion of the fruit.

Materials and methods In this study, 60 male albino rats were administered 40 mg/kg body weight AA orally for 17 consecutive days. To evaluate the nephrotoxic effects of AA, some biochemical parameters were measured. Also, 200 mg/kg body weight PP were administered orally as a prophylaxis for 31 consecutive days.

Results and conclusion In the AA group, alterations in renal function were observed, which was evident from significantly high levels of urea, creatinine, and uric acid. Estimation of serum and urine electrolytes (Na⁺, K⁺, and Cl⁻) showed electrolyte imbalance as well. AA-induced renal oxidative stress was expressed as low levels of renal antioxidants (glutathione, glutathione peroxidase, and superoxide dismutase) and high levels of renal oxidants (malondialdehyde and nitric oxide). To clarify the Pathogenesis of AA nephrotoxicity, estimation of renal nitric oxide synthase and interleukin-1 β is carried out showing high significant level. Direct damage in renal tissue is resembled in high level of renal kidney injury molecule-1. As stated before, the administration of AA resulted in acute nephrotoxicity, whereas PP played a vital role in reducing this toxicity. Lower levels of urea, creatinine, and uric acid were observed in the AA+PP group and electrolyte balance was achieved, indicating the prophylactic effect of PP. PP showed antioxidant activity as higher levels of glutathione, glutathione peroxidase, and superoxide dismutase recorded and also lower levels of nitric oxide and malondialdehyde controlling oxidative stress of AA. The levels of kidney injury molecule-1, interleukin-1 β , and nitric oxide synthase improved significantly. Finally, we can state that PP could ameliorate the nephrotoxic effect of AA.

Keywords:

acrylamide, heated food, interleukin-1 β , nitric oxide synthase, kidney injury molecule-1, nephrotoxicity, pomegranate peels