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Assessment of the oral findings, salivary oxidative status and IgA level among group of workers exposed to petroleum pollutants in Al-Daura oil refinery

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Abstract

Background

Petroleum is perhaps the most important substance consumed in modern society. Petroleum is unique and is a complex mixture of thousands of compounds. Oil refinery workers are continuously exposed to numerous hazardous materials and working conditions that place them at continuous risk of injury and death. Petroleum contains the heavy metals as a natural constituent or as additives. The main threats to human health from heavy metals are associated with exposure to lead, cadmium, mercury and arsenic. Several carcinogenic metals such as arsenic, cobalt, chromium, lead, mercury, and nickel induce redox reactions in living systems. These metals induce the production of reactive oxygen species in both in vivo and in vitro systems. These radicals have rendered oxidative damage to deoxyribonucleic acid, proteins, and lipids. Secretory immunoglobulin A is the main immunoglobulin found in mucous secretions from the tear glands, salivary glands, mammary glands, the respiratory system, the genito-urinary tract, and the gastrointestinal tract.

Aims of the study

Assessment of the salivary levels of heavy metals among the workers of Al-Daura oil refinery, assessment of the oxidative status in the oral cavity of the workers by measurement of Malondialdehyde and Superoxide dismutase markers, assessment of the oral immunological activity by measurement of secretory immunoglobulin A level in saliva and Assessment of the oral findings among the workers.

Subjects, Materials and Methods

This study was done in Al-Daura oil refinery, samples consist of 60 workers involved in refining processes as study group subdivided into three subgroups which represent the different sections in the refinery and 20 subjects not involved in refining processes as control group. Oral examination and saliva collection was done to assess the oral findings and measure the level of heavy metals (lead and cadmium), oxidative status (Malondialdehyde and Superoxide dismutase) and secretory IgA.

Results

The mean of salivary lead and cadmium was higher in study group (6.34 $\mu\text{g}/\text{dl}$ and 0.56 $\mu\text{g}/\text{l}$ respectively) than that of control group (3.3 $\mu\text{g}/\text{dl}$ and 0.34 $\mu\text{g}/\text{l}$ respectively) with highly significant difference ($p<0.001$). Results of this study showed a significant increase in salivary malondialdehyde (15.3ng/ml) and salivary immunoglobulin A (464.36 $\mu\text{g}/\text{ml}$), and significant decrease in salivary superoxide dismutase (1895.1 pg/ml) among the study group. Lead has shown significant linear correlation ($p<0.05$) with malondialdehyde and IgA. A significant reverse correlation ($p<0.05$) was found between heavy metals (lead and cadmium) and superoxide dismutase. The oral examination revealed no oral lesions of interest.

Conclusion

Workers in Al- Daura oil refinery exposed to pollution with heavy metals (lead and cadmium) which was associated with changes in the biochemical and immunological findings among the oral cavity.