

EVIDENCE OF OXIDATIVE DNA DAMAGE IN CHILDREN WORKING IN THE SURGICAL INSTRUMENTS INDUSTRY IN SIALKOT, PAKISTAN

Muhammad Sughis, *Department of Public Health, KULeuven, Belgium, Centre of Research for Public Health, Pakistan, Lahore College of Pharmaceutical Sciences, Pakistan*

Tim S. Nawrot, *Centre for Environmental Sciences, Hasselt University, Belgium, Department of Public Health, KULeuven, Belgium*

Asad Amjad, *Centre of Research for Public Health, Pakistan, Lahore College of Pharmaceutical Sciences, Pakistan*

Ihsan-ul-Haque Syed, *Centre of Research for Public Health, Pakistan, Lahore College of Pharmaceutical Sciences, Pakistan*

Haufroid Vincent, *Laboratory of the Industrial Toxicology and Occupational Medicine Unit, Université Catholique de Louvain, Belgium*

Nemery Benoit, *Department of Public Health, KULeuven, Belgium*

Background and Aims: A considerable part of the worldwide production of surgical instruments takes place in Sialkot. Many children also work in this industry without protective measures. In a cross-sectional study, we investigated the possible health effects of occupational exposure in these children as compared with schoolchildren living in Sialkot, Pakistan.

Methods: We studied 145 male children (mean age 12.1 years): 75 children from a school in Sialkot and 70 children working in surgical instruments subcontracting units. A respiratory questionnaire was administered, spirometry was performed with an electronic hand-held spirometer, and blood pressure was measured with an automated device. Spot urine samples were collected and concentrations of metals were measured by inductively coupled plasma-mass spectrometry (ICP-MS) and 8-hydroxy-2'-deoxyguanosine (8-OHdG) by ELISA. Urinary 8-OHdG is an indirect reflection of oxidative DNA damage.

Results: The working children reported more asthma (7% vs 0%; $p=0.01$) and dry cough at night (36% vs 20%; $p=0.03$) than the schoolchildren, but there were no significant differences in spirometry or blood pressure between the two groups. Urinary concentrations of ten metals (Cr, V, Mn, Ni, Cu, Se, Mo, Cd, Sn, and Sb) were higher in children working in surgical instruments manufacturing units than in controls. In the working children, the geometric mean concentration of Cr was 25.6 $\mu\text{g/g}$ creatinine (95% CI 17.8 to 36.8) which was 39-fold the value found in schoolchildren (0.66 $\mu\text{g/g}$ creatinine; 95% CI 0.55 to 0.80). According to the ACGIH, the Biological Exposure Index for Cr is 10 $\mu\text{g/L}$. For the other metals the fold-differences between working children and schoolchildren ranged from 1 to 7. Urinary levels of 8-OHdG were 24% higher in working children compared with school children (22 vs 18 ng/g creatinine). Urinary 8-OHdG was positively associated with urinary concentrations of Cr ($r=0.2$; $p=0.01$).

Conclusion: This first biomonitoring study of metal exposure among children working in the surgical instruments manufacturing industry reveals a substantial exposure to several metals, especially chromium, which is an established carcinogen. Exposure to chromium was associated with evidence of increased oxidative DNA damage.