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Occupational exposure to E-Waste and risk of cancer development: Evidence from South-South Nigeria

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Nigeria remains the destination for uncontrolled volume of electronic waste (e-waste) in Africa and to date; management practices for imported and locally generated e-waste remain completely primitive. It was recently documented that the majority (88.8%) of Nigerian e-waste workers (with exposure burden of ≥6 hours per day; ≥6 days per week) worked without personal protective devices regardless of the volume of toxic substances, some of which are known carcinogens, documented to be found in e-waste. In this pilot study, blood levels of key toxic metals [Lead (Pb), Mercury (Hg), Arsenic (As), Cadmium (Cd) and Chromium (Cr)]; status of enzymatic and non- enzymatic biomarkers of oxidative stress as well as prostate-specific antigen (PSA) and alpha fetoprotein (AFP) levels as cancer risk prediction indices were determined inNigerians occupationally exposed to e-waste (n=63) and in age-matched unexposed participants (n=41) in Benin City, South-South Nigeria. Whole blood levels of Pb, As, Cd and Cr were determined using standard electrothermal atomic absorption spectrometry while Hg was determined using inductively coupled plasma-mass spectrometry. Serum levels of oxidative stress biomarkers [Malondialdehyde (MDA), Uric acid (UA), Albumin (ALB), Total bilirubin (TBil) and Conjugated bilirubin (Cbil)] and activities of enzymatic antioxidants [Glutathione reductase (Gr), Catalase (Cat), Superoxide dismutase (SOD) and Glutathione peroxidase (GPx)] were determined using standard colorimetric methods. Levels of PSA and AFP in serum were determined using Enzyme linked Immunosorbent Assay. The results showed a significantly elevated body burden of toxic metals in e-waste workers compared with unexposed group. Lipid peroxidation biomarker (MDA and UA) levels were significantly raised in e-waste workers compared with unexposed group.In addition, CAT, SOD and GPx were significantly reduced in e-waste workers compared with unexposed group. Comparatively different observations were not registered in the activity of GR and levels of ALB, TBil and CBil between exposed and unexposed participants. PSA and AFP levels in e-waste workers were significantly elevated compared with the non-exposed group. In addition, 26% of e-waste workers compared with 11% of unexposed participants registered values higher than the reference range of PSA (0-4.0 ng/mL) used for healthy subjects. The findings in this study suggest that the elevated body burden of toxic metals and the significantly high oxidative stress in the e-waste exposed population may be an indication of occupational metal toxicity associated with crude e-waste management practices in Nigeria. The observed significantly high oxidative may be a predictive mechanism of chemical carcinogenesis in Nigerian e-waste workers and the elevated cancer risk biomarkers (PSA and AFP) in the e-waste workers may be associated with occupational exposure to known carcinogens in e-waste.

Biography

Igharo O G holds a bachelor's degree in Medical Laboratory Science and a Master's degree in Applied Biochemistry. He is Currently Pursuing a Doctorate degree in Chemical Pathology/Toxicology. He is a certified Medical Laboratory Scientist and a University Lecturer in Nigeria.

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