

Atomic Absorption Spectroscopic Analysis of Heavy Metals in Cancerous Breast Tissues among Women in Jos, Nigeria

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Abstract : Breast cancer is prevalent in northern Nigerian women, most especially in Jos, Plateau State, owing to anthropogenic activities such as solid earth mineral mining as far back as 1904. In this study, atomic absorption spectrometry was used to determine the concentration of eight heavy metals (Cd, As, Cr, Cu, Fe, Pb, Ni, and Zn) in cancerous and non-cancerous breast tissues of Jos Nigerian Women. The levels of heavy metals ranged from 1.08 to 29.34 mg/kg, 0.29 to 10.76 mg/kg, 0.35 to 51.93 mg/kg, 5.15 to 62.93 mg/kg, 11.64 to 51.10 mg/kg, 0.42 to 83.16 mg/kg, 2.08 to 43.07 mg/kg and 1.67 to 71.53 mg/kg for Cd, As, Cr, Cu, Fe, Pb, Ni and Zn respectively. Using MATLAB R2016a, significant differences ($t_v = 0.0041 - 0.0317$) existed between the levels of all the heavy metals in cancerous and non-cancerous breast tissues except Fe. At 0.01 level of significance, a positive significant correlation existed between Pb and Fe, Pb and Cu, Pb and Fe, Ni and Fe, Cr and Pb, as well as Ni and Cr ($r = 0.583 - 0.998$) in cancerous breast tissues. Using ANOVA, significant differences also occurred in the levels of these heavy metals in cancerous breast tissues ($p = 1.910510 \times 10^{-26}$). The relatively high levels of the cancer-induced heavy metals (Cd, As, Cr, and Pb) compared with control indicated contamination or exposure to heavy metals, which could be the major cause of cancer in these female subjects. This was evidence of contamination as a result of exposure by ingestion, inhalation, or other means to one anthropogenic activity of the other. Therapeutic measures such as gastric lavage, ascorbic acid consumption, and divalent cation treatment are all effective ways to manage heavy metal toxicity in the subjects to lower the risk of breast cancer.

Keywords : breast cancer, heavy metals, spectroscopy, bio-accumulation

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