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(UG*) X-ray Fluorescence Measurements of Zinc and Selenium in Toenail Clippings

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Zinc and selenium are essential elements that are necessary for a human's health. Researchers have found that deficiencies in these elements can significantly affect the human body. In this study, I analyzed nail clippings from mothers and their infants from New Zealand to observe zinc and selenium concentration levels over the first year postpartum. Several biomarkers, including nails, were collected at three, six, and twelve months postpartum. Every mother had two sample cups prepared with nail clippings (one with big toenail clippings and one with other toenail clippings), each containing four samples labeled MB and MO, respectively. Each mother had a corresponding infant with one sample cup prepared with four nail-clipping samples labeled I. This study used portable X-ray fluorescence to examine the nail samples from the 12-month visit. These results were then compared to the 3-month and 6-month visits. The average zinc XOS concentration in this study (3rd visit) for the MB, MO, and I was 115 ppm, 96 ppm, and 84 ppm, respectively. The average zinc total area ratio (TAR) for the 3rd visit for MB, MO, and I was 1.51%, 1.35%, and 1.45%, respectively. Selenium TAR results for the 3rd visit for MB, MO, and I was 0.022%, 0.021%, and 0.023%, respectively. Several significant differences were found when comparing the three visits. Between the first and third visits, infant zinc concentrations significantly decreased for XOS ($p=0.035$) and TAR ($p=0.014$). Several significant differences were also found in selenium concentration between visits for MB, MO, and I. Selenium is often below the detection limit for XOS concentration reporting and would benefit from additional measurement time, such as 3 minutes. A correlation was found between the concentrations of mothers' big toenails and their other toenails.

Keyword-1

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Keyword-2

Medical Physics

Keyword-3

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