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**Quantification and health risk assessment of cadmium and lead content in skin creams sold in the Sri Lankan market.**

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Across history, humans used diverse personal care products with a rising global demand over time. Mineral pigments, frequently employed in colored cosmetics, represent a prominent origin of heavy metal contamination within cosmetic products. Increased exposure to heavy metals can trigger adverse health effects. This study aims to analyze Cd and Pb concentrations in skin creams in Sri Lankan market, as well as to evaluate the health implications linked to metal exposure. Skin creams were collected from 21 brands, comprising whitening (3), face (8), body lotions (7), and baby creams (3) categories. Identities were anonymized with codes (W1-W3, F1-F8, L1-L7, B1-B3). Samples were digested and subjected to metal analysis via Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Potential health risks were assessed by analyzing Hazard Quotient (HQ), Hazard Index (HI), and incremental lifetime cancer risk (ILCR). Cd concentrations ranged from  $0.013 \pm 0.001$  to  $0.085 \pm 0.011$  mg kg<sup>-1</sup> (mean:  $0.039 \pm 0.002$  mg kg<sup>-1</sup>) and Pb levels varied from below the limit of quantification (ND) to  $1.066 \pm 0.047$  mg kg<sup>-1</sup> (mean:  $0.146 \pm 0.006$  mg kg<sup>-1</sup>). The average Cd levels in whitening creams, face creams, body lotions, and baby creams were found to range from  $0.064 \pm 0.002$  (W3) to  $0.085 \pm 0.011$  (W2),  $0.013 \pm 0.001$  (F6) to  $0.047 \pm 0.002$  (F4),  $0.026 \pm 0.001$  (L7) to  $0.051 \pm 0.001$  (L3) and  $0.020 \pm 0.001$  (B3) to  $0.055 \pm 0.001$  (B1) mg kg<sup>-1</sup>, respectively. In whitening creams, face creams, body lotions, and baby creams, the average Pb levels ranged from  $0.343 \pm 0.062$  (W2) to  $1.066 \pm 0.047$  (W3), from ND in case of F7 and F8 to  $0.108 \pm 0.001$  (F6) mg kg<sup>-1</sup>, from ND in L2, L3, L4, and L6 to  $0.203 \pm 0.002$  (L5) and from ND in B1 and B2 to  $0.026 \pm 0.002$  (B3) mg kg<sup>-1</sup>, respectively. All Cd values met Canadian (3 mg kg<sup>-1</sup>) and Germany (5 mg kg<sup>-1</sup>) standards while Pb levels stayed below Canadian (10 mg kg<sup>-1</sup>) and USFDA (20 mg kg<sup>-1</sup>) thresholds. For Cd, W2 had the highest HQ ( $2.826 \times 10^{-9}$ ), while W3 obtained the highest HQ ( $0.042 \times 10^{-9}$ ) for Pb. No significant health risk was found for any sample, implying minimal consumer impact. Cumulative HI was below one, indicating no adverse effects. Cd and Pb ILCR values ranged from  $1.273 \times 10^{-11}$  to  $8.619 \times 10^{-11}$  for Cd and ND to  $15.030 \times 10^{-11}$  for Pb, highest in W2 and W3 respectively. The analysis of Cd and Pb concentrations in various brands has shown minimal levels, consistently below the limits set by regulatory authorities. Evaluation of health risk indicates that their presence remains within acceptable parameters. While frequent dermal contact is not expected to pose a cancer risk for the studied heavy metals, excessive use could lead to long-term health issues. However, it is recommended to maintain continuous monitoring and the presence of other heavy metals in cosmetics, while strictly adhering to established safety thresholds.

**Keywords:** Beauty creams, Health risk, Heavy metals, ICP-MS