
Objectives: Iron is the essential trace element (TE) in human nutrition, but also the most frequently observed deficient element in the human nutrition. The aim of this study was to assess human iron nutritional status by assessing its frequency distribution in the hair with a median derivatives bioassay.

Methods:

In this prospective, observational, cross-sectional, exploratory, and epidemiological study we have analyzed hair Fe ($^{\text{HFe}}$) in 1073 apparently healthy adults (339 men M and, 734 women, W) from Zagreb, Croatia. Whole blood iron ($^{\text{WBFe}}$) was assessed in a subsample of this population in 143 Women and 91 Men. Both hair and whole blood samples were analyzed for iron with the ICP MS at the Center for Biotic Medicine, Moscow, Russia. Hair Fe natural frequency distribution was analyzed with the median derivatives bioassay logistic sigmoid curve for men and women separately. The range of values below the linear segment of the sigmoid curve (adequate intake) was considered to reflect Fe deficiency, whereas values above that range indicate Fe dietary excess.

Results:

Women and men have almost identical amount of $^{\text{HFe}}$ (median $^\text{♂} 12.72 \mu g \cdot g^{-1}$ vs median $^\text{♀} 12.428 \mu g \cdot g^{-1}$). The physiologically adequate $^{\text{HFe}}$ linear segment range of the sigmoid curve was 6.09 – 32.19 $\mu g \cdot g^{-1}$ for Men and 6.11 - 28.23 $\mu g \cdot g^{-1}$ for Women. Similarly, both women and men have very similar amount of $^{\text{WBFe}}$ (median $^\text{♂} 535.6 \mu g \cdot g^{-1}$ vs median $^\text{♀} 4880 \mu g \cdot g^{-1}$). The physiologically adequate $^{\text{WBFe}}$ linear range of the sigmoid curve was 386.4 – 606.1 $\mu g \cdot g^{-1}$ for $^\text{♀}$ and 470.4 – 631.0 $\mu g \cdot g^{-1}$ for $^\text{♂}$.

Conclusions: Human nutritional status of Fe may be reliably assessed by analyzing its frequency distribution in the hair with median derivatives bioassay. Hair iron is a rare case between the bioelements we have tested thusfar where wholeblood concentrations were higher than that in the hair. Our exploration indicates that the so called iron subclinical deficiency may be adequately quantified. Indeed, continuous subliminal iron supplementation may be a better therapeutic option than current supplementation with high doses associated with the unwanted side effects.

Funding Sources: Institute for Research and Development of Sustainable Ecosystems,
Presenting Author(s)

Berislav Momčilović
Institute for Research and Development of Sustainable Ecosystems, Zagreb, Croatia
Zagreb, Grad Zagreb, Croatia

Co-Author(s)

Juraj Prejac
University Hospital Centre Zagreb; University of Zagreb, School of Dental Medicine, Zagreb, Croatia
Zagreb, Grad Zagreb, Croatia

Ninoslav Mimica
University Psychiatric Hospital Vrapče; University of Zagreb, School of Medicine, Zagreb, Croatia
Zagreb, Grad Zagreb, Croatia