

# **DEDICATION**

To the soul of my late Father

To my Mother

Husband,

Sons,

Daughter,

Brothers and sisters,

Teachers,

and

Friends.

**With wishes of healthy and happy future....**

**Afra'a**

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Finally, with great appreciation I would like to thank my family members for their sincere support to me.

## **ABSTRACT**

Increasing industrialization and "chemicalization" of every sphere of human activity has created evident disturbances in the natural environment that affect human health.

From among thousands of antropogenic chemical compounds present in the air, water and soil, an increased concentration of heavy metals is considered harmful to living organisms. One difficulty is assessing the concentration of these elements and finding out the accurate and reliable methods for their measurement.

For this reason the purpose of this study is to evaluate the use of Atomic Absorption Spectrophometer beside x-ray fluorescence spectrometer as analytical method which are available for detecting, measuring, and/or monitoring the trace elements. The intent is to identify well-established methods that can be used as the standard methods of analysis in our country.

The concentrations of 6 trace elements in the nail and hair of 67 volunteers from a rural area in western Kordufan considered as a non-industrialized environment were determined by Atomic Absorption Spectrometer (AAS). Another study was carried out to determine the concentration of heavy elements from volunteers in Khartoum state using x-ray fluorescence spectrometer.

Means of concentration and standard deviation are presented for each element, along with a summary of the effects of age, sex, social habits and resources of water on the concentration of each element. Correlations for each element between

hair and nail were determined. Concentrations of trace elements were positively correlated in hair and nail.

It was found that all participants with increased hair trace elements concentration had increased of at least the same trace elements in their fingernails samples.

The sensitivity and specificity of the atomic absorption technique was obtained using the detection of trace elements concentration and its correlation ability between hair and fingernail samples and found to be 91.96% and 100% respectively. Similarly, its accuracy obtained by the positive and negative predictive values at 95% confidence interval (95% CI) which was very high, as it was 100% and 94% respectively.

The concentration of these trace elements obtained from the current study can be accepted as a reference for future studies in the field, as are carried out in a non-industrialized area and the overall means lies within the internationally accepted range.

## الخلاصة

قد أدت زيادة التصنيع وانتشار الكيمائيات في كل مجال من مجالات النشاط البشري إلى إضطرابات واضحة في البيئة الطبيعية التي من الممكن أن تؤثر على صحة الإنسان.

من بين الآلاف من المركبات الكيميائية الموجودة في الهواء والماء والتربة، تعتبر زيادة تركيز المعادن ضارة للكائنات الحية. ويعتبر واحدة من الصعوبات استخدام معايير موثوقة وذات كفاءة دقيقة لقياس تركيز هذه العناصر.

ولهذا السبب، فإن الغرض من هذه الدراسة هو تقييم استخدام المضواء الطيفي بالامتصاص الذري وجهاز الأشعة السينية التوهجية الطيفي كأداة تحليلية حيث انهما يعتبران من المقاييس المتاحة في الكشف وقياس أو رصد هذه العناصر. والقصد تحديد الأساليب الراسخة التي اعتدنا أن تكون من اهم الطرق القياسية للتحليل المتاحة في بلدنا.

واجريت هذه الدراسة لتحديد تركيزات 6 من العناصر في الأظافر والشعر لدى 67 من الاشخاص المتطوعين لهذا البحث في منطقة ريفية، بغرب كردفان حيث تعتبر بيئتهم غير صناعية. وتم تحديد تركيز هذه العناصر بمطياف الامتصاص الذري.

واجريت دراسة اخرى لتحديد تركيز العناصر الثقيلة في ولاية الخرطوم ذات الطبيعة الصناعية بإستخدام مطياف الأشعة السينية.

وتم عرض وسائط التركيز والانحراف المعياري لكل عنصر، جنباً إلى جنب مع ملخص لتأثير العمر والجنس والعادات الاجتماعية وموارد المياه على تركيز كل عنصر. وتم تحديد العلاقات المتبادلة لكل عنصر بين الشعر والأظافر. حيث وجد ان هنالك ارتباطاً في تراكيز العناصر إيجابياً في الشعر والأظافر. وخلصت الدراسة ايضاً أن جميع المتطوعين الذين يوجد عندهم زيادة في تركيز العناصر النادرة في شعرهم هنالك زيادة في تركيز العناصر نفسها على الأقل في عينة أظافرهم.

بالنسبة للمضوء الطيفي حسبت الحساسية والنوعية وخصوصية الجهاز المستخدم في الكشف عن تركيز العناصر النادرة التي تم الحصول عليها ومقدار الدقة وعلاقته التركيز بين عينات الشعر والأظافر وجدت انها تمثل 91.96% و 100% على التوالي. وبالمثل، دقتها التي حصلت عليها القيم التنبؤية الإيجابية والسلبية في فارق الثقة 95% (95% فاصل الثقة) الذي كان مرتفعاً جداً، كما كان 100% و 94% على التوالي.

تركيز هذه العناصر التي تم الحصول عليها من الدراسة الحالية يمكن ان تكون مقبولة كمرجع للدراسات المستقبلية في هذا المجال، حيث ان العينة اخذت في منطقة غير صناعية وتراكيز العناصر ضمن نطاق التراكيز المقبولة والمعتمدة دولياً.

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