

IRON AND ZINC CONCENTRATIONS AND MICROBIAL FLORA OF HAIRS AND NAILS OF SOME ADULT WOMEN FORM RIYADH CITY, SAUDI ARABIA

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ABSTRACT

In this study, hair and nails levels of iron (Fe) and zinc (Zn) were determined in healthy adult women (No. 20) ages 18-21 year. The hair and nails contain high concentrations of zinc 15.39 ± 0.64 ; 14.48 ± 0.31 followed by iron 4.73 ± 0.16 ; 14.23 ± 0.43 respectively. The level of Fe and Zn were found to be lower than that reported at different places in the world. Many genera of microorganisms were isolated from the tested samples. Hair and nails can be considered as useful parameters for measurement of the accumulation of trace elements in the human body.

Keywords: Iron, Zinc, Trace elements content, Hairs, Nails, Microflora.

INTRODUCTION

Heavy metals differ from other toxic substances in that they are neither synthesized or destroyed by human. Nevertheless, their utilization by human influences the potential for health effects by environmental transport and by altering the speciation or biochemical form of the element (Goyer, 1982; Beijer and Jernelov, 1979; Li, 1981). Metals are redistributed naturally in the environment by geologic, biologic processes or, by human activities and accumulated in soil, water and air then enter the food chain which probably represent the largest source of exposure include consumer products and industrial wastes as well as working environment (Schroeder, 1962). Blood, urine, hair and nails are the most accessible tissues in which to measure dose and are some times referred to as indicator tissues (Friberg *et al.*, 1979). Hair and nails can be useful in assessing variations in exposure to metal over the long term (Al-Nasser and Hashem, 1996). Significant variations in blood concentrations of trace elements are known to occur in many pathological conditions. There are various studies related to the blood trace elements status in patient with malignant diseases, such as leukemias and lymphomas (Bucher and Jones, 1977). Little attention has been paid to the role of trace elements in human diseases in Saudi Arabia. Correlation between blood levels, metal concentration in hair and nail is not expected because blood levels reflect only current exposure. The total iron content of the human body varies with age, sex, nutrition, and state of health (Wells and Awad, 1992). Hashem and Al-Othman (2001) have determined the level of iron and zinc in the hair and nails of healthy volunteer women from Saudi Arabia. Hair and nails are the most frequently studied tissues for estimation of heavy metals. Although a great deal is known about the microbial flora of Saudi Arabia, no information is available about the microbial flora of hair and nails from woman in Saudi Arabia. In the present investigation, the level of Fe

and Zn and Microbial flora of hair and nails in healthy adults women form Riyadh City were determined.

MATERIAL AND METHODS

Heavy metals:

Samples of hair and nails were collected form different adult women from Riyadh city, Saudi Arabia. Solid samples were washed immediately with ethyl alcohol and dionized water, then dried and stored. Samples of hair and nail (0.5 g) were added to concentrate nitric acid (10 ml) and heated moderately under refluxing for complete digestion. Dilute nitric acid was used for dissolution of ash obtained by wet decomposition and the volume was made up to 100 ml with dionized water. The undissolved residue was removed and supernatants were stored and refrigerated in plastic test tubes. Standard solution were prepared by dissolving 1 g of Zn metal in 30 ml of 5 M nitric acid, 1 g of Fe metal in 20 ml of 5 M hydrochloric acid, and diluted to 1 liter with deionized water. Calibration solution was prepared freshly everyday by dilution of standard solution to final concentrations of 50 and 25 ppb Fe and Zn suitable for two standard calibration points. Standard and samples were measured on electrothermal atomization atomic absorption spectrophotometer, Pye Unium SP9 equipped with graphic Furnace and Fideo Computer Programmer. Instrument background correction were carried out in the setting procedure by using deionized water acidified with nitric acid in the ratio of 1 : 4 (Hashem and Al-Othman, 2001).

Isolation and identification of bacteria and fungi:

1- Collection of samples:

The samples were collected in sterile, wide necked screw-capped container. In addition, a sterile swab was moistened by sterile water and passed over the scalp hair and nails.

2- Isolation of bacteria and fungi:

Blood agar, chocolate agar, Mac Conkey agar were used for the isolation of bacteria, while Sabour aud agar was used for isolating fungi. all media used were prepared according to (Atlas, 1993).

3- Identification of bacterial isolates:

Bacterial isolates were identified according to Bergey's manual of systematic Bacteriology (Krieg and Holt, 1984; Schleifer, 1986).

4- Identification of fungi isolates:

Mold and yeast were identified according to Gilman (1957), Von Arx (1970) and Rippon (1982).

RESULTS AND DISCUSSION

The iron (Fe) and zinc (Zn) concentration of hair and nails of some healthy adult women from Riyadh city, Saudi Arabia are given in table 1.

Table 1. Iron (Fe) and Zinc (Zn) concentrations in hair and nails of some healthy adult women from Riyadh city, Saudi Arabia (n = 20, ± = Standard Deviation).

Hair (mg Ig ⁻¹)		Nails (mg Ig ⁻¹)	
Fe	Zn	Fe	Zn
4.73 ± 0.16	15.39 ± 0.64	14.2 ± 0.43	14.48 ± 0.31

It is apparent that the concentrations of Zinc in both hair and nails samples were much greater than that of iron. Domestic and international comparison of the data from human present difficulties since, there is considerable diversion in the concentrations of these metals in populations. The present study indicated that the levels of Zn and Fe are lower than that of the earlier studies in hair and nails of some healthy volunteer women in Saudi Arabia and some man workers in Saudi Arabia (Hashem and Al-Othman, 2001; Al-Nasser and Hashem, 1996).

Hashem and Al-Othman (2001) reported that the level of Zn in the hair and nails (65.8 ± 3.16; 39. 18 ± 2.63) of 19 years old girl that of higher than the other volunteer women, and this could reflect the growth period of this girl, Zn requirements increase at puberty possibly in association with the high concentrations (Eva Cotriero and Marcella, 1994).

Hashem and Al-Nasser (2000) reported that the concentration of iron in hair and nails from different workers volunteer male from Riyadh city ranged between 12 to 67 ug/g respectively. Hashem and Al-Othman (2001) reported that the concentration of iron in hair and nails from some healthy volunteer women from Saudi Arabia ranged between (0.95 ± 0.11 to 18.67 ± 1.01; 11.48 ± 0.32 to 42.85 ± 1.93 mg/g) respectively. The data were lower than that reported earlier from different places in the world (Weber *et al.*, 1990). The iron deficiency is the most frequently encountered, clinically manifest deficiency diseases in main, in adult men and postmenopausal women the principle cause is chronic blood loss due to infections malignancy bleeding ulcers, and hook worm infestation, iron deficiency anemia is much more common in women than in men because women of fertile age are subject to additional iron loss in menstruation, pregnancy, and lactation (Nderwood, 1971). Hair and nails can be ideal indicators of metal toxicity to the human body and to Saudi Arabian environment.

The results of microbial isolated from hair and nails are given in Table 2.

Table 2. Microbial flora isolated from hair and nails.

Hair		Nails	
Bacteria	Fungi	Bacteria	Fungi
<i>Bacillus sp.</i>	<i>Aspergillus sp.</i>	<i>Pseudomonas sp.</i>	<i>Microsporium sp.</i>
<i>Klebsiella sp.</i>	<i>Cladosporium sp.</i>	<i>Micrococcus sp.</i>	<i>Trichophyton sp.</i>
<i>Micrococcus sp.</i>	<i>Penicillium sp.</i>	<i>Staphylococcus sp.</i>	Yeast
<i>Pseudomonas sp.</i>	<i>Trichosporon sp.</i>		
<i>Staphylococcus sp.</i>	<i>Trichophyton sp.</i>		

There are thousands of known species of bacteria and fungi. Table 2 showed that all isolated microorganisms in this investigation were also isolated from different places of the world from hair and nails of human beings (El-Said - AHM, 1996; Kuijpers and Tan, 1996; Assoumou *et al.*, 1993; Ghannoum *et al.*, 2000). Yeasts were mainly isolated as double infections. Species isolated differed in their predilection for different parts of the human body. The tested samples contained highly number of genera of bacteria and fungi than the nails samples and this may be due to the contamination of the hair from different sources of shampoo and soap which they are a good media for microbial growth. Hair, nails and microbial flora can be ideal in indications of heavy metals and microorganisms pollution in Saudi Arabia.

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دراسة مستوى الحديد والزنك والفلورا الميكروبية لعينات شعر وأظافر بعض السيدات البالغات والصحيحات من مدينة الرياض

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في هذه الدراسة ، تم تقدير مستوى الحديد (Fe) والزنك (Zn) في عينات شعر وأظافر لسيدات بالغات وصحيحات يتراوح أعمارهن بين 18-21 سنة ، حيث تحتوى عينات الشعر والأظافر بالتتابع على تركيزات عالية من الزنك (Zn) $(15,39 \pm 0,43$ ، $14,48 \pm 0,31$ ملليجرام/جرام) ثم الحديد (Fe) $(4,73 \pm 0,16$ ، $14,2 \pm 0,43$ ملليجرام/جرام). وقد لوحظ في هذه الدراسة انخفاض تركيز كل من الحديد (Fe) والزنك (Zn) مقارنة بالدراسات السابقة في مناطق مختلفة من العالم. كما تم عزل خمس أجناس بكتيرية وأخرى فطرية من عينات الشعر ، وكذلك ثلاث أجناس بكتيرية وأخرى فطرية من عينات الأظافر المختبرة. ويعتبر كل من الشعر والأظافر وسيلة جيدة للكشف عن آثار المعادن المتراكمة في أجسام الأشخاص.