

Biomarker of impact mercury accumulation by using cosmetics in women's Sadr City - Iraq – Baghdad

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Abstract: In this study, it has a biological monitoring level of mercury in the hair and nail samples for 30 volunteers from the women in Sadr City. A vital indicator of the accumulation of mercury in the body uses intensive incorrect for cosmetics and evaluated the correlation between the specific characteristics that can affect the exposure powders. In January 2015, Women were invited to participate. The interview was run questionnaire was used to collect information About the age, body weight, height and periods of use of cosmetics and kinds as well as the level of education, family income and the number of abortions, Results of hair total mercury concentration was $(0.29 \pm 7.03 \text{ mg / g})$. Maternal hair mercury was above the WHO threshold level (WHO) (5 micrograms / g). About Nail total mercury concentration was $(0.19 \pm 4.23 \text{ mg / g})$. Also positive correlation among between them ($r=3.82$). A significant relation (<0.001) . These survey samples were higher than the USEPA-recommended $1 \mu\text{g/g}$, which represents a serious health risk to women in this city

Keywords: Mercury, Hair, Nail , Cosmetic exposure.

1. Introduction:

Sadr City or Revolution district is a poor suburbs and large geographically in north-east of the city of Baghdad (Rusafa), Dating back to established era of former Iraqi leader Abdul Karim Kassem, who created in the sixties of the twentieth century. Sadr City is divided into sectors, each sector space around (250 square meters) ($500 \text{ m} \times 500 \text{ m}$) and includes 80 sectors, Equal in size and design of different. According to the Iraqi Ministry of Planning [1] the lower estimate of the number of residents of Sadr City at the moment more than 3,000,000 people - the equivalent of one-third of the current population of Baghdad, This caused problem in demographic and service in this area. Environmental pollution of this urban area starts from the garbage and muddy water covering the streets and the pollution of water, air and noise pollution, and urban landscape building as random etc. There is a big problem everywhere, a poverty that made the purchase of cheap materials, which negatively affect people's lives and more widespread cosmetics greed merchants open and import led to the Cosmetics cheap and poor at the same time. Women in Sadr City are

interested in these products, so we take in this study effect of the use of these products for women. Iraq is a developing country therefore difficult for a stop poor people from using cheaper Cosmetics. Skin-whitening creams containing mercury women used for skin color, as the mercury is absorbed through the skin [2,3] other study conducted by [4] have showed that exposure of the cells of the placenta to cause the accumulation of mercury metal in the placental membrane, which may affect the function of the membrane and cause harm to fetus.

The levels of mercury in Cosmetics must be less than 1 ppm [5] There are no published reports in Iraq that appear. The nature and extent of exposure to mercury in women except for [6] examined levels of mercury in hair ,blood and nail samples from women in Iraqi marshes ; she was found There are high concentrations of elemental mercury by fish that are considered residents of the area a major element of nutrition, which role result to abortions recurrent fetal malformation. The commercial market in Sadr City It is unhealthy and is not under to the control it's clear from any warning sign listed on cosmetic package as showing in next website:

<http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm>

The main subject of women is creams Whitening and cosmetics in the markets significantly so not being able to control the quality and quantity of up to these lotions uncontrolled health by the quality control in the Ministry of Science and Technology, which we receive from all over the world, especially the Arab countries after the expiry and used by the greed merchants for profit are cheap in poor areas like Sadr City. With the away of the Ministry of Health even media terms for monitoring such cases and that many cosmetic lotions that claim to whiten the skin and restore freshness and youth, and it claims many on the ability of these compounds to overcome the shortcomings of modern medicine and it's not based on any scientific evidence documented[1]. Hydroquinone doing by stopping the production of melanin, a substance found inside the skin which cause the color to give brown. At the beginning of the use of the creams it appears to user that the skin has already been clear, but when user exposed to sunlight effect be high, leading to an increase in browning and thus re-used more of the cream and long time for many year thats cause dark spots skin and the occurrence of pain as the increase in the concentration of elemental mercury side effects disturbances of liver and kidney and its impact on the placenta of pregnant women sometimes leads infertility [7]

The purpose of this study that women in Sadr City usually a used these stuff skin whiteners contaminated with mercury for long periods more than 10 years without taking into account the health concerns that cause infertility and recurrent abortions as well as renal failure and other conditions may we will do that in another manuscript. Hair sample and nails as a vital indicator of exposure of mercury because It does not involve the use of hair on any penetration of the body, cheap cost, accurate and obtain a sample without pain despite the obsession women of sorcery including the conduct sufficiently to determine exposure mercury.

2. Materials and Methods

2.1 Collection Sampling

Samples were collected from 30 volunteer's women from Sadr City - Baghdad – Iraq Questionnaires were completed for each participant by our team and the approval of each patient. Samples were collected in February 2013 and placed in clean plastic bags and labeled for analysis of mercury, which was used with the standard configuration and ASX-510 (Cetac, USA). Of some information about the women .Age, body weight, height, length uses it, education, family income and number of abortions. The uses of stainless steel scissors to cut 100 strands of hair (50 mg) were cut from the occipital region of the scalp according to the method of [8]. Each hair sample was weighed and cut into small pieces about one cm in length and placed in a plastic bag. The average weight of collected hair was 500 ± 600.1 mg, nail clippings were collected using steel nail clippers and stored in a plastic bag. The average weight of toenails was 8 ± 13 mg. Each hair or nail sample was washed twice with 1% Triton X-100, rinsed once with acetone, twice with deionized water, and finally once more with acetone. The washing volumes in each step were 5 mL and 30 mL for hair and nails, respectively, and the duration of each wash was three minutes. Samples were subsequently dried overnight in an oven at 50 °C. When dried, each sample was weighed and kept into a vacuum desiccator until analysis.

2.2 Cosmetic samples

Were collected remnants of mixtures used by women in cosmetic stores and presented to pharmaceutical specialist for separating and knowledge components that make up and it turns out that it consists of: Rose cream (Glycerin , hydroquinone), Ideal cream (Tretinoin ,hydroquinone) ,Fair and Lovely cream (B3, allantoin) Shirley(allantoin, hydroquinone),Top Shirley (Chemical Peeling , Kojic acid , hydroquinone)Super Rose (Tretinoin, hydroquinone) ,Beauty Face cream (cream apple) (Azelaic acid , hydroquinone) Nestle cream (hydroquinone, B-quinol) ,Cream of barley (spike) (Kojic acid , allantoin), Vit.E Capsules number 7 special skin , Sunscreens .and amino derivatives (diethanolamine) .

Also there are different labels on packages benzohydroquinone; benzoquinol; ,4-dihydroxybenzene; p-dihydroxybenzene; p-dioxobenzene; p-dioxybenzene; hydroquinol; p-hydroxyphenol; quinol; B-quinol

2.3 Mercury Analysis

Hair and Nail were analyzed with a DMA 80 M (Direct Mercury analyzer Milestone) determines total mercury within one standard deviation of certified values which heats samples in a reagent matrix to 850 °C and measures the gaseous mercury vaporized in the process. Our analysis used a high calibration curve for all measurements. Quality assurance was done by the analysis of samples in triplicate (triplicate analysis of each original triplicate sample that was collected) the inclusion of blanks, certified reference materials, as well as by doing a standard calibration run using matrix-matched standards. Procedural blanks were run along with matrix-matched standards with each analytical batch to determine analytical accuracy. It is the closest percentages were obtained with the rest of the tests. Quality control of the analysis was verified by the routine analysis of the following certified reference materials:

Total Hg concentrations were quantified by LECO, AMA (advanced mercury analyzer) 254, AMA (USA) according to ASTM, standard No. D-6722. In order to confirm the accuracy and precision of mercury determination process, SRM (standard reference materials), SRM 1633b, SRM 2709, and SRM 2711 in five replicates were used. Average recovery of reference standards reached 109.92%. In addition, there was a good agreement between the obtained mean and the certified value. Calibration standards for hair and toenail samples were prepared by adding known amounts of aqueous Hg solution to 1 mL of 0.5 g digested pooled hair or toenail samples to give final concentrations in the range of 1.35 to 20.23 µg/L for hair and 0.895 to 9.06 µg/L for nail.

Standard references material	NIST*	Certified value	Obtained mean	Standard deviation	Recovery (%)
NIST 1633	5	0.133	0.212	0.06	100.0

NIST 2709	5	1.246	1.187	0.19	101.2
NIST 2711	5	5.067	4.151	0.12	98.02

Table 1 Results of quality assurance procedure for mercury (µg/g).

2.4 Statistical Analysis

Statistical analysis was performed using Sigmaplot. (Version 12.5) . Descriptive statistical parameters such as mean, minimum, and maximum values and SD were calculated to describe the metal contents in Hair and Nail samples. Differences among various brands were tested for significance using the one way analysis of variance (ANOVA) at a significance level of p0.05.

All measurements were log-transformed before they were subjected to ANOVA test. The accuracy of the method was determined by measuring the recovery of mercury added to skin-lightening cream samples. These spiked cream samples were run with the test samples using the same analytical procedure. The analytical recovery for mercury at the various concentrations tested (0.05, 0.1, and 0.2 ppm) was 86-98%. Good linearity was obtained for metals in the concentration ranges examined. The correlation coefficients (r) of calibration curves of mercury, 0.98.00 certified reference materials

The precision was expressed as a percentage of relative standard deviation (%RSD). The precision values were within the acceptable limits.

3: Results and Discussion

3.1 : Hg exposure in Hair and Nail

The most important findings of our results study risk factors that women exposed to mercury deposited from cosmetics, The composed material which is material hydroquinone and other basic material contained within these creams, Mercury as background this material for lightening and which cause damage to the skin which is concentrated in the hair and nails resulting in abortion and cases of sterility allowable percentage for that substance in cosmetics in Europe 2%, However, the state such as the UK has blocked a final presence in all cosmetics [9]. Results showed a high values between accumulation

mercury in hair and nails, as in the Fig (1) This is same case as with previous studies in Table 2. Through the results we obtained it there is a convergence with previous studies as the average concentration of samples used ranged between (7.3-0.29, 4.23- 0.33 ppm) hair and nails respectively that there is a possibility of exposure to a wide range of Pollutants in the cosmetics. that's mean about more than 90 % of number of women exceeded more than half the safety standards of 1 ug / g Hair mercury, which is equivalent to a dose of Reference 0.1 mg / kg bw / day established by the United Weight US Environmental Protection Agency [17].The lowest rate in control of the lady number 30 who we considered because she did not use cosmetics or hair dyes for 20 years ago as well as being have high level educated and is aware of biological risks and was weighing very suitable to the length. Attributed to mercury contamination in cosmetics to insufficient raw purification materials and use of dyes that contain the ingredient in the cosmetics industry Products [18,19]. Can the packaging of cosmetic products also predispose products, External contamination. Also container Design, specifically dispensing closure, may play an important role in protecting Product of the consumer or environmental contamination during used [20].

The product was also used by those women testing was concluded that skin exposure to mercury through those cosmetics frequently resulting in the accumulation of mercury [17]. There was a significantly correlation relationship between the number of cosmetics for women and the number of abortions recorded as 10% of women with infertility 0.031 (r = 5.83) p-value with women hair dyes by 100% 0.011 (r = 6.94).

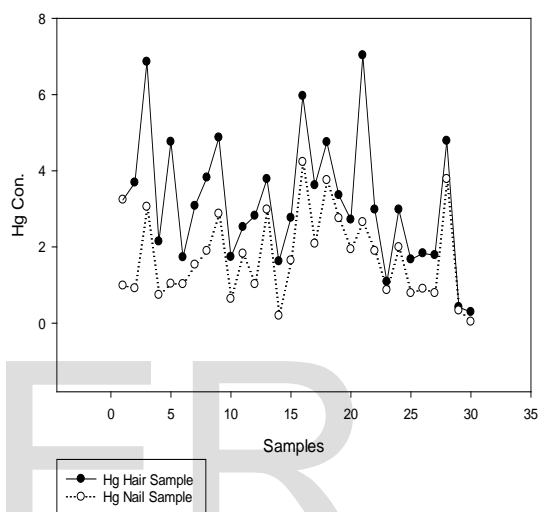


Fig 1: shows the correlation between mercury concentration in Hair and Nail under the study.

Country	Sampling	Population group	Mercury	Reference
Brazil	Hair	Children 7 to 12	14.45	Santos, 2002
		Women 14 to 44	15.7	
Canada	Hair	Women 15-35	4.4	Muckle, etal 2001
Spanish	Hair and Nail	Women 15-45	22.11	Sanzo, etal 2001
USA	Hair	Women 15-45	0.4	Smith,etal 1996
Nigeria	Hair and Nail	Women 20-35	Other	Nnorom,2011
Saudia	lipstik	women	Other	Iman, etal 2011
Saudia	Hair	Women 20-45	17.5	Iman, etal 1997
Iran	Hair and Nail	15-45	13.4	Hoda,2014
Iraq	Hair and Nail	20-45	6.47	Reyam, 2013

Table 2: Other studies of the biological monitoring of exposure mercury for some countries (10,11,12,13,14,15,7,16,6)

Considered the total mercury levels in the hair of women in risk assessment in the questionnaire were considered independent variables. It was 43-17 years. There was a significant impact on people with respect to the concentrations of Hg (p = 0.08). Average weight in the study population was 89.23 ± 5.41 kg and the average weight for height with 172.45 ± 11.85 cm. Investigation of the relationship between body weight and the level of contaminated indicates the presence of any link significance (p = 0.22). Mercury levels in the hair is not associated with the rise of women (p = 0.54). Also investigated the effect of abortion and the number of stages of pregnancy on the concentrations of mercury. The average number of pregnancies among women (2-7) with one infertility , Through comparison between mercury and unprecedented number of repeated

miscarriages correlated with the use of cosmetic and hair dye with number of years of use with the characteristics of women results show the procedure for quality assurance increased concentration accordingly. Ninety percent Women did not complete primary school. In this study, the 98% of women use cosmetics once at least every day for years to multiple continuous or intermittent, Table (3) It shows the relationship between the concentration of elemental mercury with weight, height, age and number of abortions. Normality Test (Shapiro-Wilk): Passed(P = 0.268) .Test execution ended by user request, One-Sample t-test begun (Mean, Std Dev, SEM) Respectively (3.156, 1.691, 0.309) Also t test = 10.222 with 29 degrees of freedom. 95% percent two-tailed confidence interval for the population mean: 2.525 to 3.788 .There is statistically significant difference between the mean of the sampled P-value = 1.999. Also the accuracy of the Hg determinations for nail analysis have been identified as concentrations varied from sample to another depending on the period most commonly used for cosmetics. Was the highest in the sample was considered one of the promoters of the product number 17 she could be penetrated the sample to the skin by the nails and the increased focus concentration mercury .Normality Test (Shapiro-Wilk) Passed(P = 0.065) Mean :1.703, (Std Dev±SEM)Respectively (1.126±0.205) . Also t test = 8.287 with 29 degrees of freedom and 81% percent two-tailed confidence interval the mean: 1.283 to 2.123. There is a statistically significant difference between the mean of the sampled P-value = 0.0195

Sample	Number	Min±Max (Hg)	Mean±SD(Hg)	p-value
Hair	30	0.29±7.03	1.23±1.11	<0.001(r=3.82)
Nail	30	0.19±4.23	1.04±0.93	<0.001(r=4.33)
Age	Used	15±45	30	0.077(r=0.768)
Weight	Normal	150±180	165	0.083(r=0.793)

Hair dye	All	_____	_____	0.011 (r=6.94)
Abortion	10%	1±7	one block case	0.031(r=5.83)

Table (3) shows the relationship between concentration of mercury in comparison with weight, height, age and number of abortions

4: Conclusions

It was clear the use of mercury in cosmetics and in use by women and thus might threaten in the final product and the consumer and the implementation of adequate quality control checks to ensure that the raw materials for cosmetics factors. Which determine the incidence and severity of adverse health effects: the chemical form of mercury and dose, age and duration of exposure as well as education and the risk of cognitive diversity of these materials to use for long periods of continuous or intermittent. Hair and nails sample be useful in monitoring the vital, especially in the long-term appreciation or exposure to mercury as mercury reflects the cumulative exposure of more than 2-4 months. Mercury levels in the body and how the body responds immediately to exposure to mercury and reflects exposure over several days to months, and disturbed immune system to show the side effects, which makes the hair sample and nails well-suited for exposure control for ease of sample collection. There were close ties between the frequent use and wrong for cosmetics with hair dye, with a focus this component This means that women who live in this region are strongly influenced by the concentration of the metal and the future impact on the new generations for a period of exposure to the coming years and how many have negative effects such as early Alzheimer's and Parkinson's [21] as well as mental retardation and to identify minerals in nails and hair with a potential benefit biomarker for the detection of mercury pollution.

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