

Evaluation of Serum Zinc Level in Patients with Chronic Telogen Effluvium in Premenopausal Adult Females in Kirkuk City.

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Abstract:

Chronic telogen effluvium (CTE) was defined as a primary idiopathic disease entity in 1996. Women suffering from CTE present with an abrupt onset of generalized shedding of telogen hair from the scalp, with or without an identifiable trigger that persists for more than 6 months. Therefore this study is conducted to detect the association of serum zinc with CTE. The study included one hundred adult menstruating female patients with age ranged between 18-49 years, complaining of hair loss from the scalp and fifty ages matched healthy female controls. Both groups were evaluated for serum zinc levels. There was strong statistically significant reduction ($p= 0.01$) in the level of serum zinc in patients compared to that in control group. This indicating that there is a definite association between decreased serum zinc levels and CTE in adults menstruating females.

تقييم مستوى الخارصين في مصل دم النساء البالغات اللاتي يعانين من تساقط الشعر التيلوجيني المزمن في مدينة كركوك.

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مفتاح البحث: زنك ، التيلوجين المزمن ، كرينوتيلوجين

الخلاصة :

عرف تساقط الشعر التيلوجيني المزمن على انه مرض مجهول السبب الرئيسي في سنة 1996. حيث ان النساء المصابات بهذا المرض يعانين من تساقط مفاجئ لشعر الرأس سواء كان بسبب معروف او مجهول وتستمر الحالة لمدة تتجاوز السنة اشهر. لذلك اجريت هذه الدراسة لتقييم العلاقة بين تساقط الشعر التيلوجيني المزمن ونقصان الخارصين في النساء البالغات. تضمنت الدراسة ادراج مئة حالة من النساء البالغات اللاتي يعانين من تساقط الشعر المزمن. وتراوحت اعمارهن بين 18-49 سنة. و تم مقارنتهن ب 50 من النساء الاصحاء .

تم إجراء المقابلة والفحص السريري لجميع النساء وبالإضافة إلى ذلك تم استخدام اختبار سحب الشعر كجزء من الفحص البدني لتقييم نمو الشعر. كما تم دراسة حالة الخارصين في المرضى ومقارنتها بالاصحاء، حيث وجد انخفاض شديد في مستوى الخارصين في مصل المرضى مقارنة بالاصحاء (p=0.01). وهذا يشير الى ان هناك علاقة واضحة بين نقصان الخارصين وتساقط الشعر التيلوجيني المزمّن في النساء البالغات.

Introduction:

Telogen effluvium is a form of non-scarring diffuse scalp hair loss; it results from the synchronous transition of hair follicles from the growth stage (anagen) of the hair cycle to the resting stage (telogen) of the hair cycle. Shedding does not occur, however, until the new anagen hair begins to grow 3 to 4 months after the inciting event.⁽¹⁾

Telogen effluvium can be divided into:

- 1- Acute telogen effluvium which lasts less than 6 months.
- 2- Chronic telogen effluvium which lasts longer than 6 months.

Chronic telogen effluvium, in some women is an early feature of androgenic alopecia.⁽¹⁾ Its onset is often insidious and it can be difficult to identify a triggering factor.⁽²⁾

Nutritional deficiencies can contribute to increased hair shedding by weakening hair shafts that cause breakage to the hair and slow regrowth, hair loss that are caused by nutritional deficiencies can be corrected by a proper nutrition.⁽³⁾ Trace elements have a much important role in the growth and health of hair such as zinc.⁽⁴⁾

Zinc is a trace mineral with widespread roles to sustain human health. It is a component of many enzymes as a cofactor and is involved in cellular division (DNA and protein synthesis) that promotes cell reproduction and tissue growth and repair.^(4,5) It also acts in the maintenance of the oil-secreting glands attached to hair follicles.⁽⁴⁾

The total daily requirement of zinc is about 15 milligrams for the average adults. Zinc is mainly excreted in the stool and in a lesser degree in the urine, skin, seminal fluid, menstrual blood, hair and nail.^(4,5) Serum zinc is a good determinant for predicting the zinc level of the body; it ranges from (70-140 µg/dl) in adults.⁽⁶⁾

Zinc deficiency may cause hair loss.⁽⁷⁾ Harrison and Sinclair found that zinc deficiency both hereditary and acquired, leads to sparse, dry, and brittle hair.⁽⁸⁾

Garcia *et al.* showed that the combined use of a shampoo and hair lotion, formulated with vitamins and zinc, shortens the course of acute telogen effluvium.⁽⁹⁾ Therefore this study is conducted to detect the association of serum zinc with CTE.

Patients and methods:

One hundred and fifty adult menstruating females attending the outpatient clinic of dermatology of Azadi teaching hospital (ATH) in Kirkuk city were included in a case

control hospital based study during the period from 25th October of 2011 till the end of march of 2012.

Their age ranged from 18-49 years. They were classified into two groups:

- 1- The case group included 100 females complaining of hair loss. They were diagnosed as CTE by history and clinical examination (Hair pull test: It done by tightly grasping 50-60 hairs firmly between thumb and forefinger followed by a pull of sufficient intensity to cause slight discomfort, there should be fewer than six normal club hairs. Several pulls may be required to test different areas of the scalp).^(10,11) Which is done by supervision of a dermatologist in ATH (figure 1).



Figure (1): Hair Pull Test.

- 2- The control group: Fifty healthy volunteers were investigating to serve as a control group. None of them had clinical or laboratory evidence of a disease that would affect the parameters to be measured.

Inclusion criteria:

All patients fitted in the definition of chronic telogen effluvium, included subjects with diffuse hair loss of at least 6 months; the diagnosis was done based on increase hair shedding by medical history and physical examination, and confirmed by a positive hair pull test.

Exclusion criteria:

Women were not included if they had a history of hair loss less than 6 months duration, surgical operation, lactation, chronic systemic disease or used medication that may be associated with hair loss in the last 6 months, and abnormal laboratory studies (except serum zinc).

Laboratory investigation

Included serum zinc level measurement which was carried out in all cases and controls, whereas the following tests were performed whenever necessary.

- 1- Complete blood count by automatic hematology analyzer .
- 2- Iron studies (iron, ferritin, TIBC, transferrin saturation) manually by colorimetric method.
- 3- Thyroid function tests by minividas kit using minividas instrument.
- 4- Renal function tests manually by colorimetric method.
- 5- Liver function tests manually by colorimetric method.

Methods :

Serum zinc was measured by colorimetric method on a spectrophotometer, using S.zinc kit manufactured by Randox laboratories, United Kingdom. As shown in table 1 and 2.

The Principle of the Method

Zinc present in the sample is chelated by 5-Br-PAPS, (5-bromo-2-pyridylazo)-5-(N-propyl-N-sulfopropylamino)-phenol in the reagent. The formation of this complex is measured at a wavelength of 560nm.

PROCEDURE 1: DEPROTEINIZATION

Table (1): DEPROTEINIZATION.

Pipette into test tube:

	Blank	Standard	Test
	H ₂ O	STD	Sample
Test Specimen	0.5(0.2) ml	0.5(0.2) ml	0.5(0.2) ml
Deproteinizing Reagent (R1)	0.5(0.2) ml	0.5(0.2) ml	0.5(0.2) ml

Mix, well then centrifuge for 10 mins at 10,000 g. Use supernatant in the zinc assay within 2 hours.

Table (2) Zinc assay.

PROCEDURE 2: ZINC ASSAY

Wavelength:	560 nm (550 - 570 nm)
Incubation Temperature:	20/25°C
Cuvette:	1 cm light path

	Blank	Standard	Test
	H ₂ O	STD	Sample
Supernatant	0.5(0.2) ml	0.5(0.2) ml	0.5(0.2) ml
Working Reagent (R2)	2.5(1.0) ml	2.5(1.0) ml	2.5(1.0) ml

Mix, incubate for 5 min at 25°C. Measure the absorbance of the standard (A standard) and the sample (A sample) against the reagent blank within 60 minutes.

Results:

The mean age of both groups who included in the study was 30.3 years. Statistically there was no difference in mean age between both case and control groups (30.3±8.5) vs. (30.4 ± 7.0), respectively; p value=0.9 (statistically non-significant). as shown in table (3).

Table (3): Descriptive Statistics of Case Group and Control Group According to Age:

	No. of cases	Min	Max	Mean	S.D
Patients	100	18	49	30.3	8.5
Controls	50	19	47	30.4	7.0

Student's t-test showed that the mean serum zinc levels to be statistically significantly low in patients with CTE hair loss than in those (control group) normal subjects without CTE. The mean of serum zinc levels in CTE cases and controls were (9.9±7 and 13.3±8.5 μmol/l, respectively). This difference in mean of serum zinc levels found to be highly significant (p value=0.01) as shown in table (4).

Table (4): Comparison of Serum Zinc Level between Cases and Controls.

	Cases	Controls	P Value
S.Zinc μ mol/l	9.9 \pm 7.0	13.3 \pm 8.5	0.01

Dietary status have a role in serum zinc level ,in this study it was appeared that the effect of the type of diet on serum zinc level was is statistically significant ($p < 0.05$).as shown in table (5).

Table (5): The effect of the type of diet on serum zinc level.

of diet	nts	rol group	ue
Mixed diet	10.7 \pm 2.0	12.41 \pm 1.5	<0.01
Vegetarian	9.5 \pm 0.5	11.62 \pm 9.8	0.01
Crash	11.5 \pm 2.0	14.8 \pm 2.0	0.07

According to menstrual duration the patients divided into periods that extend from 2-4 days, 5-7 days, and > 7 days. Only seven patients had low serum zinc level from eighteen patients who had menstruation period more than seven days and this was not significant ($p > 0.05$). There was no significant relation with occupation, and marital status.

Discussion:

Telogen effluvium is an abnormality of hair cycling that result in excessive shedding of telogen hair; it is one of the most common causes of diffuse nonscarring hair loss. Many cases of telogen effluvium are subclinical, so the true incidence in the community is unknown.^(3,12)

Frausto da Silva and Williams in 2001 stated that there were many trace elements in the human body that directly or indirectly participate in metabolism and may play key roles in its modulation. Some of these metals are calcium, copper, iron, magnesium, potassium, sodium, and zinc which have been identified as essential for human health.⁽¹³⁾

The present study demonstrated that serum zinc levels were significantly decreased in CTE patients compared to control group. This result is in agreement with that of Sinclair and Prasad.^(8, 14)

On the other hand there were some studies that disagreed with this result, Rhushton⁽¹⁵⁾ and Yacoub *et al.*⁽¹⁶⁾ who found that there was no evidence to support low serum zinc concentration in telogen effluvium patients.

The most common causes of zinc deficiency are the inhibitory effect of dietary fibers and phytates on zinc absorption (only 20% of the dietary zinc is absorbed), so its deficiencies is more common in regions with high consumption of rice and unleavened bread.^(4,5)

Some studies believed that long menstruation periods had effect in low serum zinc levels.⁽¹⁷⁾

It has been found in this study that only seven patients had low serum zinc level from eighteen patients who had menstruation period was more than seven days and this was not significant. This agreed with Haghollahi *et al.*⁽⁵⁾ Moreover, this study showed that dietary status played an important role in serum zinc level, vegetarian patients had low serum zinc level which is statistically significant p value 0.01..This finding agreed with Haghollahi *et al.*,⁽⁵⁾ Yokoi K, *et al.*⁽¹⁸⁾

The significant difference in the level of serum zinc in both groups might also have caused a distortion in the role of zinc in gene expression as well as in stabilizing the structure of proteins and nucleic acids that is necessary for the proper functioning of all cells, including the hair follicles. Specifically it was highlighted that the gene SOX21 appears to be responsible for hair loss in human subjects, although a link has not been identified between zinc and this gene.⁽¹⁹⁾

Conclusion:

It was concluded that the low serum zinc is prevalent in patients with chronic telogen effluvium.

Appreciating the importance of zinc as a factor in hair loss may be important both in designing new therapies and in generating hypotheses to better elucidate the biochemical underpinning of these disorders.

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