CORRELATION OF DURATION OF HAIR LOSS WITH TRACE ELEMENT LEVEL IN HAIR LOSS PATIENTS

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Abstract

Background: *Hair loss is a worldwide problem with significant prevalence in the developed countries. Although many pathophysiological factors have been involved in the development of hair loss, its etiology is still unclear. Trace elements.*

Objective: *To assess duration of hair loss with serum iron level in alopecia.*

Methods: *This cross sectional study was carried out in the Department of Physiology, Dhaka Medical College, Dhaka during January 2017 to December 2017. Serum iron level was estimated by flame atomic absorption spectrophotometry of thirty five newly diagnosed hair loss patients aged 18 to 45 years were study group and thirty five ages, sex and BMI matched healthy subjects were control group. Both male and female was assessed by analyzing time. In this study, the duration of hair loss was 1 to 18 months. Duration of hair loss in study group was divided in two groups such as ≤2 months and >2 months. Patients were selected from Department of Dermatology and Venerology, Dhaka Medical College Hospital, Dhaka. For statistical analysis Unpaired Student's 't' test, Chi square tests and Pearson's correlation coefficient (r) tests were performed.*

Results: *In this study, serum iron level showed negative correlation with the duration of disease in study group.*

Conclusions: *From this study, it is concluded that serum iron deficiency is associated with duration of hair loss patients.*

Keywords: *Alopecia, Iron.*

Introduction

Alopecia means any type of hair loss, thinning of hair or baldness in any hairy region of the body. Hair loss is a part of normal hair growth process. It is not a life threatening disease but causes psychological effects in most people[1].

The normal hair follicle activity is cyclical, consisting of anagen (hair growth phase), catagen (intermediate phase) and telogen (resting phase). About 86% of hairs are in anagen phase which last for 2-3 years. It is followed by short transition stage called catagen phase (between the growth and resting phases). It signals the end of active growth of hair. About 1% of total remains hairs in catagen phase and 13% are in telogen phase which last about 3 months. At the end of telogen phase, the original hair falls out and is replaced by new a new hair. This process then repeats itself over and over [2,3].

To maintain vital processes, trace elements must be present in the human body within

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certain concentration ranges. They fulfill special biological functions such as catalysts in the synthesis of proteins and enzymes. The trace elements such as serum iron (Fe^{2++}) have much important role in the growth and development of hair[4].

Iron is one of the key micronutrients in metabolism of our body. It carries oxygen and transport electron within cells including hair cells. Iron causes proliferation and differentiation of stem cell of hair follicles. It acts as a cofactor for ribonucleotide reductase enzyme for the synthesis of DNA. So, the depletion of iron prevent proper functioning of these enzymes and resulting in inhibition of proliferation of hair cells [5, 6, 7].

Trace elements act at molecular level and are active at any minute concentration. So, small amount of trace element deficiency may cause alopecia. Different researchers and organizations of different countries performed study on serum iron level with duration of hair loss in hair loss patients [8] . The gravity of this issue in Bangladeshi population is not yet known as there are less published data regarding this topic in our country. The present study is designed to assess correlation of duration of hair loss with serum iron level in hair loss patients.

Methods

This cross sectional study was conducted in the Department of Physiology, Dhaka Medical College, Dhaka from January 2017 to December 2017. The research work was carried out after obtaining ethical clearance from concerned Departments, Research Review Committee and Ethical Review Committee of Dhaka Medical College, Dhaka Thirty five different varieties of hair loss patients with age ranging from 18 to 45 years were study group and thirty five ages and BMI matched healthy subjects were control group. There were 9 male and 5 female subjects around 45 years. Those patients who have taken supplements containing iron, those who have had treatment for hair loss, patient with hormonal disorders, chemotherapy, hormonal therapy, diabetes mellitus, malignancy, thalassemia, acute infection, pregnant and lactating mother were excluded for this study.

Patients were selected from Department of Dermatology and Venerology, Dhaka Medical College Hospital, Dhaka**.** After selection of the subjects, the nature, purpose and benefit of the study were explained to each subject in details and informed written consent was taken. Before taking blood sample, detailed family and medical history were taken. Anthropometric measurement of the subjects was done. All the information was recorded in a data schedule. With aseptic precaution, 5ml of venous blood were collected from ante-cubital vein by 10cc disposable plastic syringe from each subject. Then the blood was transferred in a de-ionized glass test tube and kept in slanted position. Then the blood sample was centrifuged at a rate of 3000 rpm for 15 minutes for separation of serum. After that, supernatant serum was collected in labeled eppendorf tube and preserved in refrigerator at -20 degree centigrade temperature until analytical measurement of serum iron level was done. Serum iron level was estimated by using flame atomic absorption of spectrophotometer in spectrophotometric method in the Department of Soil, Water and Environment, University of Dhaka. Analysis was performed by using a computer based statistical program SPSS (Statistical Package for Social Sciences) Version 16. Results were presented as mean and standard deviation (mean ± SD). Unpaired Student's't' test was done to compare between the groups. Chi square test was performed to compare male and female between the groups and Pearson's correlation coefficient (r) tests was performed to explore the relationship between study parameter and duration of disease.

Results

Mean (±SD) of age, BMI systolic and diastolic blood pressure were shown in table I. The parameters did not show statistical difference between the study group and the control. Male and female distribution in the two groups did not show any significant association (p=0.231) (Table I). Serum iron (mean ± SD, µg/dl) in the alopecia group were significantly lower (p<0.001 for both) compared to healthy subjects (Table II). Serum iron level showed negative correlation (r =-0.618)   with duration of disease (Table III) in study group.

Table I

General characteristics of the subjects in both groups

	Alopecia (n=35)	Control (n=35)	*p* value
Age (yrs)	25.37 ± 6.84	27.14 ± 5.82	0.254
Sex (%) [a]			
Male	14 (40%)	19 (54.3 %)	0.231
Female	21 (60%)	16 (45.7%)	
BMI (kg/m^2)[a]	23.50 ± 3.45	24.83 ± 3.05	0.096
SBP (mmHg) [a]	114.43 ± 12.29	112.71 ± 12.78	0.287
DBP (mmHg) [a]	78.74 ± 10.18	78.00 ± 9.72	0.380
Duration of hair loss (months)a	5.26±3.84	_	_

Results were expressed as mean ± SD and number (percent) as appropriate.
n = number of subjects in each group,
BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure
Statistical analyses carried out using [a] Chi Square and [b] Unpaired Student's t-test as applicable.
P value <0.05 was accepted as level of significance

Table II

Study parameter of the subjects in both groups (N=70)

Parameter	Groups		*p* value
	AAlopecia patients (n=35)	B Healthy subjects (n=35)	
Serum iron(µg/dl)	57.56± 16.43	102.20 ± 13.58	<0.001***

Results were expressed as mean ± SD
Unpaired Student's 't' test was performed to compare between the groups. The test of significance was calculated and *p* value < 0.05 was accepted as level of significance.
N= total number of subjects, n = number of subjects in each group
*** = highly significant

Table III

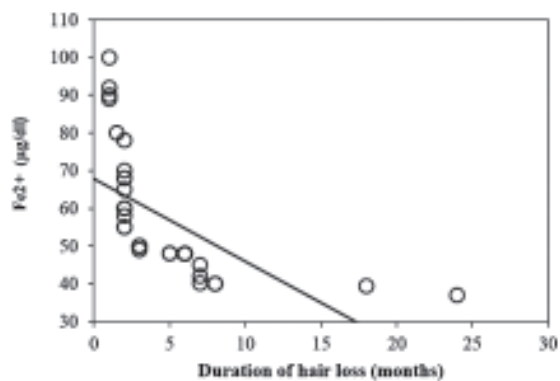*Correlation of duration of hair loss with study parameter in study group (n=35)*

Study parameter	r	*p*
Duration of hair loss with		
Serum iron (ig/dl)	" 0.618	<0.001***

Pearson's correlation coefficient (r) test was performed to observed relationship between duration of hair loss with different study parameters. The test of significance was calculated and *p* value < 0.05 was accepted as level of significance.
n = number of subjects in study group
Study group: Alopecia patients
*** = highly significant

n = number of subjects in study group
Study group: Alopecia patients
r = - 0.618, p = <0.001

Fig.-1: *Correlation of duration of hair loss with serum iron levels in study group (n=35)*

Discussion

In the present study, mean serum iron level showed negative correlation (r =-0.618) with the duration of disease in study group. There is reported value of iron is 57.56±16.43 µg/dl in study group and 102.20±13.58µg/dl in control group. Iron showed negative correlation with the duration of disease in the study group because of nutritional deficiency and environmental pollution with duration of disease. Literature review suggested that iron helps in hair follicle cell division and optimal hair growth during anagen stage of hair growth cycle by acting as cofactor of ribonucleotide reductase enzyme which is needed for DND and RNA synthesis. In deficiency, these enzyme activities are inhibited causing blockage of G1 and S phase of cell cycle, as a consequences, there is arrest of hair follicle cell division and inhibition of proliferation of hair follicle matrix cell leading to hair loss[9, 10] .

Conclusion

From the results of the study, it can be concluded that serum iron level are within normal range but significantly lower in patients with alopecia than controls. Again significantly serum iron level showed negative correlation with the duration of disease in study group. So, estimation of serum iron level might be helpful for proper management of hair loss patient.

Conflict of Interest None

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