

## Serum Vaspin Level in Patients with Androgenetic Alopecia

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### Abstract

Foreground: Androgenic alopecia (pattern alopecia), which affects both men and women, is a highly prevalent condition. In general, men are thought to have a higher incidence of androgenetic alopecia than women, however some data shows that the apparent disparities in frequency may be due to different expression in men and women. Vaspin is an adipokine that reduces inflammation. Vaspin-expressing cells are mostly keratinocytes. VASPIN modulated keratinocyte-immune cell communication and decreased the inflammatory cell production of cytokines and chemokines. Vaspin serum levels in individuals with androgenetic alopecia were evaluated in this research and its clinical importance was assessed. We used case-control design for this research. Fifty AGA patients were studied, with a control group of 30 people who seemed to be healthy but were the same age and gender as the AGA patients (Group B). In the outpatient clinic of Benha University Hospitals' Dermatology and Andrology department, patients were re-referred. Results: We found no significant differences in age, gender, or BMI between the patients and the controls in our research. The start and progression of our patients' illnesses are gradual. The average number of years that patients were sick was 9.5 years. Systemic illnesses were not present, and 82% of patients had favourable family histories; 66% of patients had had therapy for AGA. Patients with androgenetic alopecia had considerably lower serum vaspin levels than healthy controls. There were no significant associations between the Vaspin level and age, sex or smoking or BMI or duration or grading or treatment or family history or part width or acne, scalp skin, or body hair of any kind. This study found that the serum level of vaspin (AUC=0.664) had a reasonable AUC. There was an 87.5 percent negative predictive value (NPV) at the cutoff value of 2302.2 pounds per deciliter (pigs/dl). As a result, Vaspin deficiency may be utilised to detect androgenic alopecia at an early stage in the disease's progression.

**Key words:** Serum Vaspin Level, Androgenetic Alopecia.

### 1. Introduction:

Hair loss and alopecia are two of the most prevalent health issues in contemporary society, and both have significant financial and emotional ramifications. Hair loss and alopecia have recently been the subject of significant research, some of which has shown promising results. Male pattern baldness is a very prevalent kind of hair loss caused by the body's response to the male hormone androgen. An alopecia that affects the vertex and frontal temporal region of the scalp is characterised by a gradual shrinking of hair follicles in those with hereditary potential. Because of the abundant testosterone receptors in the scalps of those who are affected, the alopecia is inherited. The active form of testosterone, dihydroxytestosterone, is synthesised from testosterone by the enzyme type I, 5- reductase [1].

Dihydrotestosterone (a powerful testosterone metabolite) damages hair follicles in men, resulting in male androgenetic alopecia. Dihydrotestosterone binds to androgen receptors in hair follicles, resulting in the upregulation of genes responsible for the gradual transformation of terminal hair follicles to miniaturized hair follicles. Occipital scalps are more resistant to androgen-induced hair loss because of variances in sensitivity among scalp follicles [2].

At postmenopausal adult women, female pattern hair loss (FPHL), also known as female patterned alopecia, is a nonscarring, patterned hair loss that occurs in the crown of the scalp and the frontal hairline (Ludwig scale). There is thinning rather than baldness seen in the portion, which becomes wider toward the front. In comparison to men, women experience less of a short-

term slump. Vellus hairs (small, thin, non-pigmented hairs) are gradually replaced by terminal (big, thick and pigmented) hairs as a result of a genetically controlled shortening of the anagen phase of development. Systemic sickness such as iron deficiency or thyroid disease; drug exposure; or the presence of an autoimmune aetiology should be considered if the alopecia is widespread and nonscarring [3].

Type 2 diabetes and polycystic ovarian syndrome individuals, as well as those who are obese, may have increased insulin resistance because of the function that vaspin plays in the adipoinular axis. Evidence suggests that Vaspin may help humans with obesity-related disorders and increase their insulin sensitivity and glucose tolerance in mice [4].

The anti-inflammatory adipokine serpin protease inhibitor vaspin (SERPINA12) is also considered. Human skin's keratinocytes are the primary cells that express vaspin. Differentiated keratinocytes had higher vaspin levels, showing that its expression is linked to cell maturation. Valproic acid (vaspin) was able to control the interplay between skin cells and the immune system and reduce the generation of inflammatory cytokines in co-cultures with immune cells [5].

Vaspin serum levels in individuals with androgenetic alopecia were evaluated in this research and its clinical importance was assessed.

### 2. Patients and Methods

This study was conducted as a prospective case – control study.

### Study population

This study was conducted on 50 patients suffering from AGA (Group A) and 30 apparently healthy individuals of matched age and sex as a control group (Group B). Patients were recruited from the outpatient clinic of Dermatology and Andrology department of Benha University hospitals.

### Administrative Design & Ethical Considerations

The study was approved by the local ethics committee on research involving human subjects of Benha Faculty of Medicine. Informed consents were obtained from all individuals before being enrolled in the study.

### Inclusion criteria

Diagnosis of Androgenetic Alopecia was based on clinical findings, pattern of increased hair thinning on frontal/vertex scalp with greater hair density on occipital scalp zone and dermoscopic examination.

### Exclusion criteria

The following patients were excluded from the study:

- Replacement hormonal therapy.
- Pregnant and lactating females.
- Patients with baseline disease that causes hair loss.

Each patient was subjected to the following:

#### 1- Full history taking:

- Personal history: name, age, sex, occupation, residence, special habits of medical importance and marital status.
- Present history: onset, course, duration of androgenetic alopecia, previous treatment, as well as history of other skin diseases.
- Family history of androgenetic alopecia.
- Past history: medications (type, dose and duration) and associated autoimmune diseases.

#### 2- Clinical examination:

- Complete general examination including: Body mass index (BMI), the BMI is defined as the body mass divided by the square of the body height, and is universally expressed in units of kg/m<sup>2</sup>.
- Complete cutaneous examination: clinical assessment of Androgenetic Alopecia was done.

### 3- Laboratory investigations:

All studied subjects were tested for serum level of vaspin.

#### Sampling:

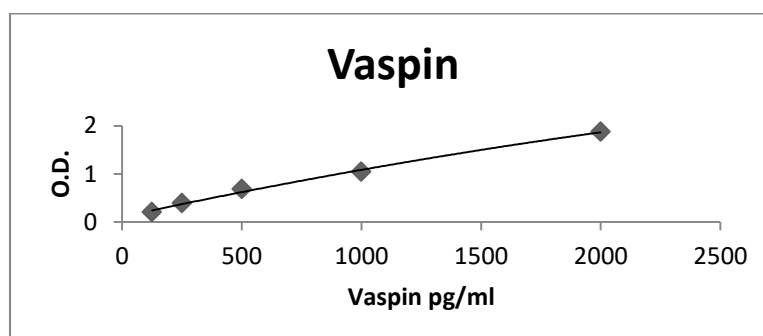
Three ml venous blood was collected from each subject by clean venipuncture using disposable plastic syringe and placed on plain tube (without anticoagulant) for serum separation. The tube was left at room temperature for 30 minutes till coagulation, and then was centrifuged (at 1500 rpm for 15 minutes). The resultant serum was stored at -20°C for further testing.

#### Vaspin:

A double-antibody sandwich ELISA (Enzyme Linked Immune Sorbent Assay) was used to detect serum level of vaspin using a commercial Human vaspin ELISA Kit for research use only (Cat #: 201-12-0922, SunRedBio, China).

#### Assay principle:

The kit was provided by a solid-phase anti-human visceral adipose-specific serine protease inhibitor (vaspin) monoclonal antibody coated to a microtiter plate. When standards and serum samples were added and incubated, the vaspin binds to the solid phase antibodies. The excess antigen washed out and a secondary anti-vaspin antibody labeled with biotin, and combined with Streptavidin-Horse Radish Peroxidase (HRP) enzyme was added and incubated to bind the antibody-antigen complex. After washing completely a 3,3',5,5'-Tetramethylbenzidine (TMB) substrate solution was added to be catalyzed by the HRP enzyme and give a blue color. The reaction was terminated by adding sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) solution where the color changed to yellow and measured spectro-photometrically at a wavelength 450 nm according to the manufacturer's protocol. The concentration of vaspin was directly proportional to the color intensity of the tested sample. The concentration of vaspin in the samples was then determined by comparing the optical density (O.D.) of the samples to the plotted standard curve.



### Statistical Methods

The collected data was revised, coded, tabulated and introduced to a PC using Statistical package for Social Science (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). Data were presented and suitable analysis was done according to the type of data obtained for each parameter.

### 3. Results

**Table (1)** Demographic data of the studied groups.

Variable		Patients group No. = 50	Control group No. = 30	Test value	P-value	Sig.
Age (Years)	Mean±SD	37.28 ± 9.62	34.97 ± 11.20	-0.979•	0.331	NS
	Range	21 – 58	19 – 60			
Sex	Females	24 (48.0%)	18 (60.0%)	1.083*	0.298	NS
	Males	26 (52.0%)	12 (40.0%)			
Smoking	Negative	40 (80.0%)	27 (90.0%)	1.378*	0.240	NS
	Smoking	10 (20.0%)	3 (10.0%)			
BMI	Mean±SD	24.5 ± 2.7	24.2 ± 2.8	-2.399•	0.562	NS
	Range	22.4 – 27.2	21.4 – 27.5			

P value ≤ 0.05 is significant.

As in table there were no significance difference between patients and control regarding age, sex, and smoking and BMI distribution.

**Table (3)** Comparison between patients and controls regarding serum vaspin level.

Lab data	Vaspin	Patients group No. = 50	Control group No. = 30	Test value	P-value	Sig.
Median(IQR)		558.0 (454.7 - 1644.5)	678.1 (518.2 – 2348.7)	2.445	0.014	S
Range		50.9 – 2800.4	330 – 2832.7			

As in table serum Vaspin level was significantly lower in Androgenetic Alopecia patients than controls (P value 0.014).

### 4. Discussion

Results of the present study revealed no significant difference between BMI values of AGA patients and the controls in the present study. Our research findings are comparable to Arias-Santiago et al. [6] and Mumcuoglu et al. [7] who did not detect significant difference in BMI values of AGA patients and controls. However, Banger et al. [8] found out significantly greater BMI in AGA patients than controls, which may be related to majority of their investigated AGA patients being diabetics.

In present research and as described in earlier studies by Assmann et al. [9] and Banger et al. [8], family history of AGA was substantially greater in study patients than controls.

The recent studies demonstrated that AGA patients had considerably reduced Vaspin levels when compared to controls.

Murphy et al. [10] argued that disrupted lipid homeostasis might contribute to organelle stress. The endoplasmic reticulum (ER), mitochondria, and peroxisomes are essential locations for the metabolism of lipids. Ron and Walter [11] and Todd et al. [12] suggested that organelle stress induced by chronic disturbance of metabolic homeostasis in hair follicle cells could lead to the generation of reactive oxygen species by the ER and mitochondria, leading to activation of stress and inflammatory signaling cascades and oxidative damage. If ER and mitochondrial equilibrium were not restored, the organelles might trigger apoptotic pathways in the hair follicle, killing it.

Some histological investigations demonstrated perifollicular inflammation in the top third of the hair follicles, indicating that inflammation has a pathogenic role in AGA, but clinically, AGA is considered a non-inflammatory condition. Oxidative stress and

inflammation are tightly related in biological systems thus; there is also evidence of oxidative stress present in dermal papilla cells of individuals with androgenetic alopecia [13].

Kim et al. [14] emphasised the relationship between AGA and dyslipidemia that there was substantial increases in cholesterol and LDL levels. As known, cholesterol is a frequent precursor for steroid hormones, including sex hormones. AGA is distinguished by androgen-driven terminal to vellus hair change on the vertex scalp presenting as progressive hair thinning. Specifically, the sensitivity to androgens is higher in the frontal area of the scalp in individuals with AGA explaining the normal pattern of hair loss [14].

Obesity is one of the primary causative factors of many inflammatory illnesses. In the skin, functional alterations in both adipocytes and lymphatic vessels and epidermal keratinocytes are hypothesized to be implicated in the obesity-induced worsening of skin inflammation [15]

Ataseven et al., [16] showed both an unaffected as well as considerably reduced serum vaspin concentrations in psoriatic individuals. Both adipokines may have a protective effect in the development of psoriasis. Altered vaspin expression could possibly contribute to the maintenance of psoriasis, since its epidermal expression was likewise down-regulated in human lesional psoriatic skin [17].

### 5. Conclusion

From the findings of current investigation, it is concluded that vaspin deficiency may have a role in the aetiology of androgenic alopecia and may be employed as a marker of the early identification of androgenic alopecia.

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