Type of the Paper (Article)

Correlation of Hormonal Profile and Lipid Levels with Late Onset Female Adult Acne

Samar M. Ragaie[1], Basma H. Mohamed[2], Hassan S. Elsayed[2], Noha N. Ahmed[2*]

[1] Dermatology, STDs and Andrology Department, Faculty of Medicine, Cairo University, Giza, Egypt.

[2] Dermatology Department, Faculty of Medicine, Fayoum University, 63511 Fayoum, Egypt.

* Correspondence: Noha N. Ahmed, nn1128@fayoum.edu.eg; Tel: (002) 0842202407.

Abstract

Introduction: Introduction: Acne, which is an inflammatory disease of the pilosebaceous unit, can be triggered by a wide variety of different factors. Acne that develops for the first time in women over the age of 25 is referred to as adult-onset female acne. There are three different types: recurrent, late-onset, and persistent.

Aim of the study: Individuals with late-onset adult female acne and an age-matched control group were compared with regard to their total testosterone, DHEAs, SHBG, C peptide, TSH, FSH, LH, and lipid profile. Also taken into consideration was the presence or absence of lipid abnormalities.

Subjects and Methods: The current case-control study was carried out on a total of one hundred adult females, fifty of whom were affected by acne, while the remaining fifty served as controls. Fasting lipid profiles and androgen levels (including total testosterone, sex hormone-binding globulin, dehydroepiandrosterone sulphate, luteinizing hormone, follicular stimulating hormone, thyroid stimulating hormone, and C-peptide) were measured in patients as well as healthy controls. ELISA (enzyme-linked immunosorbent assay) kits were used for each and every one of the hormone measurements that were taken.

Results: C-peptide, DHEAs, and TSH levels all varied significantly from one another, mathematically speaking ($P< 0.01$). The levels of LH and testosterone were found to differ from one another in a way that was statistically significant ($P >0.05$). In addition, there was not a statistically significant difference between the two groups in terms of FSH or SHBG levels ($P> 0.05$). It was determined that there was not a statistically significant difference ($P>0.05$) in the levels of cholesterol, triglycerides, HDL, or LDL between the participant group and the control group.

Conclusion: The findings lead researchers to believe that serum levels of C peptide, DHEAs, TSH, total testosterone, and LH might play a part in the pathogenesis of late-onset adult female acne vulgaris. On the other hand, it was discovered that FSH, SHBG, and lipid profile did not play any part in the development of the disease.

Key words: acne; C peptide; DHEAs; TSH; total testosterone; LH.

1. Introduction

Acne vulgaris is characterized by persistent inflammation of the pilosebaceous unit, which is comprised of the hair follicle, the hair shaft, and the sebaceous gland. This inflammation can be found anywhere on the skin, but is most common on the face. One of the skin conditions that impacts the lives of the greatest number of people across the globe [1].

The condition known as acne vulgaris is becoming more prevalent among women of working age. In most definitions of adult female acne, the focus has traditionally been on individuals who are at least 25 years old and are female. This illness can present itself in a number of different ways, including chronicity, acute onset, and relapse. Acne that does not clear up despite receiving treatment for many years is referred to as "persistent acne." Acne that develops for the first time in adults is referred to as "new-onset acne." Acne that first manifests itself during adolescence, then goes into remission for a period of time, and then reappears during adulthood is referred to as a recurrent disease [2].

There is still a lot of mystery surrounding what causes acne in adults. Androgens are considered by many experts to play a significant role in the pathogenesis of this disease. Acne is most likely caused by a heightened response of the pilosebaceous unit to endogenous androgens. There are a number of internal and external factors, including genes, hormones, diet, smoking, stress, and sun exposure, that have been linked to the development of the disease or its progression [3].

It is possible that the disproportionately high rates of adult acne that affect women are caused by a combination of hormonal factors, stress, increased use of cosmetics, and prolonged exposure to hot and humid environments (such as while cooking). Many female patients who have chronic acne experience lesions on a daily basis, and some of these patients also report experiencing a premenstrual flare. Acne that develops later in life can be further subdivided into chin acne and sporadic acne. Chin acne refers to acne that primarily affects the chin and perioral area. Sporadic adult-onset acne can appear at any time, whereas inflammatory acne on the chin tends to get worse in the days leading up to a woman's period [4]. Sporadic, adult-onset acne can appear anywhere on the face. Inaccuracies in the lipid profile can contribute to the pathogenesis of acne and should be taken into consideration when treating acne [5].

The goal of this study was to compare adult females who had late-onset acne to a control group in order to determine whether or not there were any significant differences in their lipid profiles or hormonal profiles.

2. Subjects and methods

2.1.Subjects

In the current case-control cross-section research, 50 acne cases and 50 healthy subjects, taken from the Dermatology Outpatient Clinic, Faculty of Medicine, were recruited after taking informed consent from all subjects. The sample size was calculated using OpenEpi to be 50 per group based on a previous study [6]. The hypothetical power of the study was 80%, and the ratio of cases to controls was 1:1.

This research involved two groups:

a. Control group: Fifty apparently healthy volunteers, whose age and sex were matched with patients, were selected from individuals accompanying cases with no history of:

- Contraceptive pills or hormonal device usage.
- Taking lipid lowering drugs.
- Pregnancy & lactation.
- Cardiovascular diseases.
- Smoking.
- Hormonal treatment.
- Endocrinal abnormalities.

b. Patient group: 50 cases.

Inclusion criteria

- Female case, 25 years or more, presenting with acne (all degrees).

Exclusion criteria

- Case under systemic treatment of acne less than two months.
- Cases under local treatment of acne less than one month.
- Contraceptive pills or hormonal device usage.
- Cases taking lipid lowering drugs.
- Pregnancy and lactation.
- Cases with history of cardiovascular diseases.
- Cases with history of smoking.
- Cases on hormonal treatment.
- Cases with endocrinal abnormalities.

2.2.Methods:

The following procedures were carried out on each Case:

Taking a History:

- Personal history, including name, age, marital status, residence, and any special habits that are important to the patient's medical condition.
- Provide a current history that details the onset, progression, and length of the disease.
- Previous history, including any systemic disorders and medications taken in the past.
- There is a history of acne in the family.

Examination

a. General examination: After measuring each patient's height and weight, we determined their body mass index (BMI) using the following formula:

$$\text{Weight (kg)} / [\text{Height (m)}]^2$$

b. Dermatological examination

- To classify acne according to its severity, type of lesions, and distribution across the face using a straightforward grading system [7]. It divides acne into the following categories:

➢ Mild: comedones and papules.
➢ Moderate: comedones, papules and pustules,
➢ Severe consists of all of the previous symptoms as well as nodules and cysts.

- For the treatment of hirsutism and acne complications, in the event that they occur (scars or post-inflammatory hyperpigmentation).
- Specimens Collection:

At nine in the morning, venipuncture was used to extract four milliliters of blood from the antecubital vein of each participant after they had fasted for ten to twelve hours. In order to separate the serum from the blood samples, the blood was collected in plain vacutainer tubes. After being incubated at 37 degrees Celsius for ten to fifteen minutes, they were centrifuged at a speed of three thousand revolutions per minute to separate the serum.

The following conditions were applied to the controls:

- History taking.
- The measurement of one's height and weight in order to determine their body mass index (BMI).
- The same procedure that was used to collect the patient specimen was used to collect four milliliters of blood.

2.3.Statistical analysis:

When dealing with quantitative data that are parametric in nature, an independent t-test is utilized for the purpose of comparing the parameters of two different groups of quantitative data.

Mann-Whitney U test is often considered the non-parametric alternative to the independent t-test.

If the dependent variable is ordinal or continuous but not normally distributed, then it is possible to use it to compare the differences between two different groups that are not dependent on each other.

When dealing with more than two qualitative groups, the Chi square test is utilized to compare the characteristics of the groups with qualitative data.

The threshold for statistical significance was determined to be a $P<0.05$.

3. Results

One hundred female participants were split evenly among two groups in this case-control cross-sectional study. 50 cases of acne were included in the case group. Fifty people (matched for age and body mass index) were used as a "control group," all of whom were free of acne, acne scarring, or a history of acne. Subjects were culled from the 1st of May to the 15th of July from the staff at Fayoum University's Department of Dermatology, STDs, and Andrology's outpatient clinic. The average age of the patients was 30.96 ±4.30 years (range, 26–42), while the average age of the controls was 30.96 ±4.62 years (range, 25–43). Individual BMIs ranged from 19.5 to 45.4, with a mean of 28.39±5.67, and controls' BMIs went from 20.2 to 41.52, with a mean of 29.12±5.11. When comparing the hormonal profiles of individuals and controls, mathematically important differences were found for C-peptide, DHEAs, and TSH ($P < 0.01$), for LH and testosterone ($P <0.05$), and for FSH and SHBG ($P > 0.05$) (**Table 1**, **Figure 1**).

Table 1: Comparison among case & control groups as regarding the hormonal profile.

Variables	Control group (N=50)	Patients group (N=50)	Test value	*P-value*
C-Peptide	0.4 (0.16 - 0.68) 0.06 – 1.56	0.86 (0.36 - 3.22) 0.09 – 11.36	-4.323ǂ	0.000
DHEAs	1.16 ± 0.59 0.21 – 2.59	2.21 ± 1.02 0.66 – 4.76	-6.314•	0.000
FSH	4.23 (2.63 - 5.69) 0 – 77.44	5.52 (3.2 - 7.02) 1.68 – 17.53	-1.755ǂ	0.079
LH	4.52 (2.67 - 6.74) 0.13 – 54.72	5.22 (3.68 - 8.32) 0.24 – 36.04	-1.982ǂ	0.047
SHBG	44.11 (32.36 - 64.42) 12.54 – 167.27	57.99 (39.68 - 74.64) 11.56 – 163.66	-1.920ǂ	0.055
Testosterone	0.6 (0.37 - 0.80) 0.12 – 2.32	0.74 (0.55 - 1.14) 0 – 1.68	-2.323ǂ	0.02
TSH	1.67 (1.2 – 2.6) 0.02 – 3.78	2.46 (1.55 – 3.6) 0.08 – 6.67	-2.623ǂ	0.009

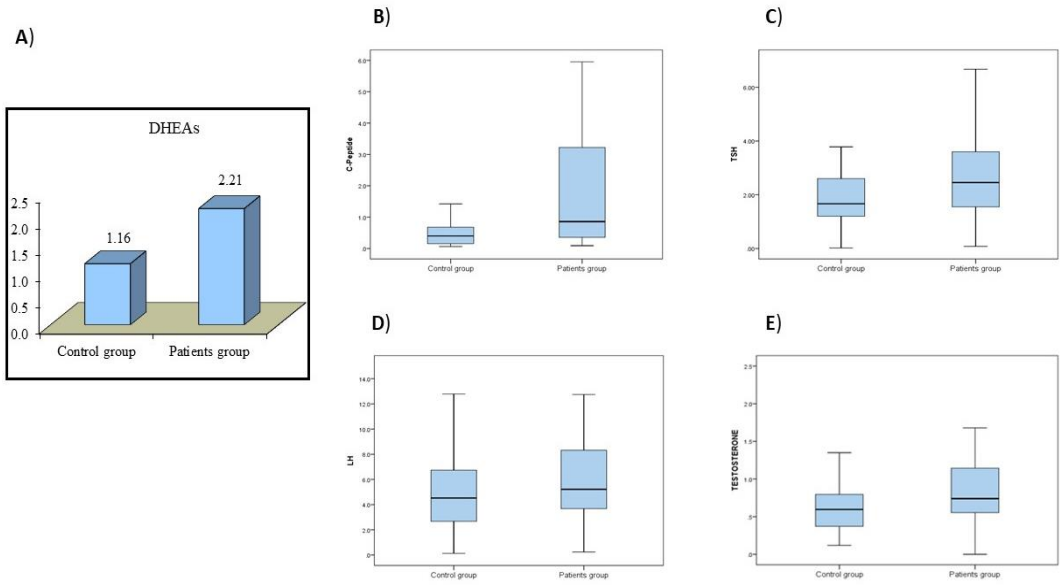

Figure 1: Comparison among case and control groups as regarding the hormonal profile. A) Comparison among DHEAs level. B) Boxplot showing comparison among C- peptide level. C) Boxplot showing comparison among TSH level. D) Boxplot showing comparison among LH level. E) Box plot of the testosterone levels.

There is not a statistically important distinction between the individuals being studied and the control groups in terms of cholesterol, triglycerides, high-density lipoprotein (HDL), and low-density lipoprotein (LDL) (*P >0.05*) (**Table 2**).

Table 2: Comparison among case and control groups as regarding lipid profile.

Variables	Control group (N=50)	Patients group (N=50)	Test value	*P-value*
Cholesterol	143.56 ± 20.32 114 – 195	144.26 ± 16.73 111 – 187	-0.188	0.851
TG	88.70 ± 37.83 62 – 297	104.96 ± 45.99 60 – 276	-1.931	0.056
HDL	47.76 ± 7.74 28 – 65	49.68 ± 8.89 32 – 64	-1.151	0.252
LDL	78.53 ± 21.74 42.6 – 131.2	73.58 ± 17.25 45.8 – 110.8	-1.262	0.210

4. Discussion

Female acne after the age of 25 is classified as adult acne [8]. This age group may have been experiencing acne since puberty, or it may be experiencing it for the first time. Acne's pathogenesis involves hyperkeratinization of hair follicles, overproduction of sebum, colonization by the bacterium *Cutibacterium acnes* (*C. acnes*), and inflammatory responses. Less certain are the roles played by smoking, genetics, antibiotic-resistant bacteria, oral contraceptives, and cosmetics in the pathogenesis of adult acne. Hormonal imbalances at the subclinical level have also been proposed as a contributor [9].

Androgens have been linked to the development of acne in a number of case studies. Androgens play a critical role in stimulating the growth of sebaceous glands and oil production [10]. Female acne after the age of 25 is classified as adult acne [8]. This age group may have been experiencing acne since puberty, or it may be experiencing it for the first time.

No statistically significant variation was found ($P > 0.05$) between the patient and control groups regarding cholesterol, triglyceride, HDL level, or LDL level. These results have been echoed in a number of other studies [6, 10–12]. Comparing lipid profiles between the case and control groups, we did not find any statistically significant difference; however, Bakry et al. (2014) and Romańska-Gocka et al. (2018) did [3, 10]. The same significance was also found by Balta et al. (2014) and Arora et al. (2010), albeit only in relation to TC and LDLC concentrations [5, 13].

There was no substantial correlation between hormone levels and acne severity ($P > 0.05$). Serum testosterone levels were inversely correlated with DHEAS levels in three studies [14–16]. Acne severity was found to be inversely related to the lipid profile [3]. These findings are at odds with

those of Franik et al. (2018), who discovered a positive correlation for DHEAS [17]. Total testosterone, cholesterol, and LDL-C are both higher in people with severe AV, while SHBG and HDL-C are lower [18].

It was determined that there was no statistically significant difference ($P > 0.05$) in the levels of cholesterol, triglycerides, HDL, or LDL between the individual's group and the control group. These findings have been corroborated by a number of other research efforts [6, 10–12]. We did not find any statistically significant difference when comparing the lipid profiles of the case group and the control group; however, other studies did [3, 10]. Even though their findings were limited to TC and LDLC concentrations, Balta et al. (2014) and Arora et al. (2010) came to the same conclusion regarding the significance of the correlation [5, 13].

It was found that there was not a significant correlation between hormone levels and the severity of acne ($P > 0.05$). In three separate studies [14–16], researchers found that an inverse correlation existed between serum testosterone levels and DHEAS levels. According to the findings of Romańska-Gocka et al. (2018), the severity of acne has an inverse relationship with the lipid profile [3]. The findings of Franik et al. (2018), who discovered a positive correlation for DHEAS, are in direct contrast to the findings presented here [17]. According to the findings of Ebrahimi et al. (2019), individuals who suffer from severe AV have elevated levels of total testosterone, cholesterol, and LDL-C but lower levels of SHBG and HDL-C [18].

Because there is mounting evidence linking abnormal hormonal levels and lipid profiles in adult females with acne, the current research aims to detect the serum level of hormonal and lipid alteration in patients with late-onset female adult acne and compare them to an age-matched control group. This is being done because there are patients with late-onset acne who are adults.

The report enlisted the participation of fifty adult females who suffered from acne, while another fifty adult females who did not suffer from acne served as controls. Fasting lipid profiles and androgen levels (including total and free testosterone, sex hormone-binding globulin, dihydroepiandrosterone sulphate, luteinizing hormone, follicular stimulating hormone, thyroid stimulating hormone, and C-peptide) were measured in patients as well as healthy controls.

The levels of serum C peptide were significantly different between the case group and the control group ($P < 0.02$). None of the other studies that we looked at focused on the same protein; however, those that investigated the correlation between female acne and insulin resistance, such as the one by Kartal et al. (2015), discovered that basal insulin was substantially higher in individuals with acne than in the control group ($P < 0.05$) [19]. In addition, Sharma et al. (2019) discovered a connection between insulin resistance and adult acne that was found to be statistically significant, which suggests a possible causal connection among the two conditions [20]. On the other hand, Balta and colleagues (2015) concluded that insulin resistance did not play a significant role in the pathogenesis of acne in adults [13].

In this study, the levels of testosterone in the serum of the cases were significantly lower than the levels in the controls ($P < 0.05$). Other studies found that female acne vulgaris was significantly associated with elevated serum testosterone [10, 16, 21]. Each of these studies had a *P-value of 0.05*. When compared with the controls, the case subjects had significantly higher levels of testosterone in their serum. We found a statistically significant difference in serum total testosterone levels between the individual's group and the control group, in contrast to the findings of Mikhael et al. (2014) and Akdoan et al. (2018) [6, 22]. This difference was found between the individual's group and the control group. There was a statistically significant difference between the individuals' serum DHEA levels and those of the controls ($P < 0.01$). According to the findings of Iftikhar and Choudhry (2019), the difference in serum DHEA levels that existed among the cases and the controls was statistically significant ($P < 0.05$) [15]. We found that, contrary to the findings of Tsvetanova et al. (2018) [23].

Conclusion

The serum levels of several hormones, including C-peptide, testosterone, DHEAs, luteinizing hormone, and thyrotropin-stimulating hormone, may contribute to the etiology of adult female acne, as has been hypothesized. No association was found across serum SHBG, FSH, or lipid profile levels. Verification of our findings may require a sizable sample size. We suggest more research be done on the causes and effects of androgens, including testosterone, DHEAs, LH, TSH, and C peptide, on adult female acne.

Ethical considerations: The research project was approved by Fayoum University's medical school's ethics board number (M401). Subjects gave their consent after being fully briefed on the study's purpose, their role in the research, and their right to decline participation.

Patient consent: Participation permission and agreement: In-formed written consent from individuals who were given the opportunity to participate in the research was obtained.

Funding: This research is not funded.

Conflicts of Interest: All authors declare no conflict of interest. Availability of data & materials: Upon reasonable request, the corresponding author will make available the datasets used and/or analyzed during the current research.

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