Original paper

Abnormal plasma lipids profile in women with post-adolescent acne

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Abstract

Introduction: Acne vulgaris is a multifactorial chronic inflammatory disease that is increasingly recognized in adult women.

Aim: To investigate a relationship between plasma lipids profile and acne in women and a correlation between selected clinical features of acne (severity, age of onset, location of lesions and the presence of comedones) and lipids profile.

Material and methods: Sixty-four adult women with post-adolescent acne and 20 healthy controls were included in the study. Plasma total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C) levels were determined in all the subjects.

Results: Adult women with acne had statistically significantly increased levels of TC, TG and LDL-C compared to healthy controls ($p < 0.05$). The level of HDL-C did not differ between the two groups. There was no relationship between higher levels of TC, TG and LDL-C and a clinical picture of acne.

Conclusions: Acne in adult women is likely to be associated with increased levels of TC, TG and LDL-C. This abnormality seems to be important in the pathogenesis of adult acne and could be a result of high fatty acid diet. Performing a lipid profile examination in women with acne should be taken into account when screening patients and followed by appropriate dietary recommendations.

Key words: acne, women, lipids.

Introduction

Acne is a chronic inflammatory disease with multifactorial pathogenesis. It affects an increasing number of adult women, especially active, working women in their 20s to 40s [1]. Post-adolescent acne can be divided into two groups: persistent acne (type 1), which is a continuation of acne from adolescence, and late-onset acne (type 2) with first occurrence of symptoms after the age of 25 years, accounting for approximately 80% and 20% of cases, respectively [2]. It is generally mild to moderate in severity and presents with more inflammatory lesions and fewer comedones compared to adolescent acne [3].

The causes of post-adolescent acne have not been completely clarified. Androgens are considered the major factor involved in the pathogenesis [4]. Acne probably results from an exacerbated response of the pilosebaceous unit to the normal circulating androgen levels [3]. Acne can be triggered or worsened by endogenous and exogenous factors, including genetic predisposition, hormone concentrations, diet, smoking, stress, and exposure to ultraviolet light [5]. Little is known about the relationship between blood lipids and acne. It is possible that the increase level of total cholesterol (TC), low density lipoprotein cholesterol (LDL-C) and triglycerides (TG) could play a role in post-adolescent acne pathogenesis, as well as the decreased level of high density lipoprotein cholesterol (HDL-C), although further research is necessary to elucidate this [6].

Aim

The aim of the study was to investigate a relationship between plasma lipids profile and acne in women and a correlation between selected clinical features of acne (severity, age of onset, location of lesions and the presence of comedones) and lipids profile.

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Material and methods

Ethical approval was obtained from the Ethics Committee of *Collegium Medicum* in Bydgoszcz, Poland, before the initiation of the study. Informed written consent was obtained from all the participants. A total of 84 women were enrolled to the study, 64 women with acne (either persistent or late-onset) at the age of 20–46 years, and 20 healthy women as controls, at the age of 21–46 years. The control group consisted of volunteers who have visited our outpatient clinic for reasons not related to acne. At the beginning of the study, clinical examination was performed. It included the assessment of acne severity, according to the Hayashi *et al.* grading system [7]. Based on the number of inflammatory eruptions on a half of the face, acne was scored as: 0–5 mild, 6–20 moderate, or 21–50 severe. The type of acne was established: type 1 (beginning in adolescence) or type 2 (first symptoms after 25 years old). Finally, other clinical features of acne were assessed, such as location of acne lesions (only on the face or together in facial and extrafacial locations) and the presence of comedones. Patients had taken neither oral isotretinoin nor oral antibiotics for at least 6 months before the study. None of our patients took any hypolipidemic drugs in the past. None of patients was obese, body mass index (BMI) was in the normal range. The familial history of lipid disturbances was unknown. Patients did not take oral contraceptives for at least 6 months before the study.

Statistical analysis

Statistical analysis was carried out using Statistica 12.5 software. Results are expressed as mean ± standard deviation (SD). The parameters of descriptive statistics such as: arithmetic mean (x), standard deviation (SD), minimal and maximal value (min. and max.) have been shown. Analysis of distribution of the tested parameters was performed using the Shapiro-Wilk test. Parameters with a normal distribution were developed using *t*-test, while parameters not having normal distribution, using Mann-Whitney test. The differences were considered significant if the *p* value obtained was $p < 0.05$.

Results

In total, 84 women were enrolled in the study. The mean age of the acne group was 25.5, and of the control group 28.5. Among 64 cases, moderate acne was established as the most frequent (50%), mild acne concerned 33% and severe acne 17% of the patients. Fifty-eight percent of our patients reported the onset of acne in teenage years (type 1), 42% of patients – after 25 years of life (type 2). In the majority of patients, acne lesions were located only on the face (83%), whereas in 17% of them symptoms were present on the face, chest and back. Besides inflammatory lesions, comedones were present in 55% of cases. The clinical features of acne in the examined group are presented in Table 1.

Plasma TC, TG and LDL-C levels were significantly higher in women with acne than in healthy controls ($p < 0.05$). Regarding the level of HDL-C, there was no significant difference between cases and controls, as shown in Table 2.

Results for parameters such as TC, TG and LDL-C in patients from the studied group were higher and differences amounted to 15.1 mg/dl for TC (mean for the studied group was 182.2 mg/dl compared to the mean of 167.1 mg/dl for the control group), for TG, the result was higher by 20 mg/dl (96.6 mg/dl vs. 76.6 mg/dl), and for LDL-C, the result was higher by 18.9 mg/dl (101.5 mg/dl vs. 82.6 mg/dl).

The higher levels of TC, TG and LDL-C, as well as the level of HDL-C, were independent of age and not connected with the clinical features of acne, such as the severity of acne, the age of onset, location of lesions and the presence of comedones (Table 3).

Discussion

Acne is a common skin problem, affecting women at higher rates than men. In the majority of cases of women, post-adolescent acne is mild to moderate [8, 9], comprising mainly inflammatory lesions [1]. In our studies, mild to moderate acne was found the most frequently, too. It affected a total of 83% of women up to 46 years old, but besides inflammatory lesions, we have also found comedones in high percentage in 55% of cases.

In almost all the patients, acne represents persistence of the disease, rather than the new-onset acne [10]. We observed that 42% of the studied patients with acne, reported the late onset of their disease, thus confirming an increasing incidence of the problem among adult women, contrary to Cunliffe opinion [10]. Similarly,

Table 1. Clinical features of acne in the studied group

Clinical features of acne		Number of subjects	Percentage
Severity of acne	Mild	21	33
	Moderate	32	50
	Severe	11	17
The onset of acne	Type 1	37	58
	Type 2	27	42
Location of symptoms	Face	53	83
	Face, chest and back	11	17
Presence of comedones	No comedones	35	55
	Presence of comedones	29	45

Table 2. Plasma lipids profile analysis of acne patients and controls

Parameter	Patients	Mean	SD	Min.	Max.	*P*-value
Age	Acne patients	27.5	6.1	20.0	46.0	0.46[U]
	Controls	30.3	9.2	21.0	46.0	
TC [mg/dl]	Acne patients	182.2	29.3	115.9	258.9	0.04[T]
	Controls	167.1	24.8	132.8	213.8	
TG [mg/dl]	Acne patients	96.6	35.6	49.9	212.1	0.01[U]
	Controls	76.6	21.6	47.8	144.1	
LDL-C [mg/dl]	Acne patients	101.5	23.2	58.9	170.2	0.01[U]
	Controls	82.6	29.8	11.5	135.5	
HDL-C [mg/dl]	Acne patients	62.3	12.0	30.7	93.6	0.26[T]
	Controls	59.1	10.6	44.8	79.5	

SD – standard deviation, min. – minimal value, max. – maximal value, TC – total cholesterol, TG – triglycerides, LDL-C – low-density lipoprotein cholesterol, HDL-C – high-density lipoprotein cholesterol. U – Mann-Whitney test, T – t-test.

Table 3. Analysis of the relationship between the lipids profile and selected clinical features of acne

Parameter	Type 1		Type 2		*P*-value
	Mean	SD	Mean	SD	
Age [years]	26.5	5.9	29.0	6.0	0.103[U]
TC [mg/dl]	178.7	25.3	186.9	33.9	0.269[T]
TG [mg/dl]	93.7	36.4	100.6	34.8	0.291[U]
LDL-C [mg/dl]	100.2	23.2	103.3	23.6	0.491[U]
HDL-C [mg/dl]	60.5	8.5	64.7	15.4	0.175[T]
Extra-facial location:	No		Yes		
Age [years]	27.8	6.2	26.1	5.3	0.395[U]
TC [mg/dl]	183.6	30.4	175.2	23.3	0.389[T]
TG [mg/dl]	96.5	37.7	96.9	24.4	0.972[U]
LDL-C [mg/dl]	102.7	23.9	96.1	20.0	0.394[U]
HDL-C [mg/dl]	62.7	12.3	60.0	10.5	0.501[T]
Presence of comedone:	No		Yes		
Age [years]	26.8	5.0	28.3	7.2	0.688[U]
TC [mg/dl]	179.5	31.6	185.5	26.4	0.420[T]
TG [mg/dl]	91.7	38.3	102.5	31.7	0.073[U]
LDL-C [mg/dl]	99.9	24.1	103.5	22.4	0.453[U]
HDL-C [mg/dl]	62.9	13.1	61.5	10.8	0.649[T]

U – Mann-Whitney test, T – t-test, SD – standard deviation.

Ekiz *et al.* reported late-onset acne in 47.8% of studied patients [9].

The persistency of acne among adult women and the difficulties in treatment need further exploration of possible pathogenetic factors. Sebum production is considered as one of the principal factors involved in acne development. The importance of hormonal influence on sebum secretion is also confirmed in clinical and experimental studies. However, studies have not shown any clear pattern of abnormalities, suggesting that hormonal receptors expressed in sebocytes and keratinocytes may be more sensitive to normal levels of androgens [11].

It is possible that one of important features of post-adolescent acne in women is an abnormal lipid profile. This could be a result of diet. Some studies revealed that adults with acne have higher levels of TC, TG and LDL-C, whereas the level of HDL-C is normal or even lower in comparison with healthy controls [6, 9, 12, 13]. We dis-

covered that, according to some previous publications, the plasma levels of TC, TG and LDL-C were significantly higher in women with acne than in healthy controls and that the HDL-C level did not differ in the two compared groups. We did not observe a lower level of HDL-C in acne patients contrary to other authors [6, 9, 12]. Contrary to results of El-Akawi *et al.*, we did not confirm that the higher level of TC was observed only in obese women. In our group of patients there were no obese patients. We did not observe the relationship between the lipid profile and the severity of acne, contrary to Bakry *et al.* studies in which higher values of TC together with lower values of HDL-C were significantly associated with severe acne [6]. El-Akawi *et al.* concluded that the increased level of LDL-C is related to severe acne [12], whereas Jiang H *et al.* observed a correlation between increased TC and LDL-C levels and severe acne in women [13]. Ekiz *et al.* did not find a significantly higher level of TG among acne patients [9].

We did not find any data evaluating the correlation between the lipid profile and the age of onset of acne in the literature. Our studies did not detect a significant relationship between the results and the onset of acne.

The influence of diet on acne aggravation has been already discussed in the literature [14]. There are no papers indicating the importance of low cholesterol diet in acne. Studies concentrate on the high-glycemic load diet and dairy food, especially milk, enhancers of insulin/IGF-1 signaling leading to acne aggravation [15, 16]. Cholesterol is a sterol, present in animal cells and body fluids, an important constituent of cell membranes and precursor for the biosynthesis of steroid hormones, including cortisol, aldosterone, estrogen and testosterone. It must be attached to certain protein complexes called lipoproteins in order to be transported through the bloodstream [17]. Triglycerides are the main constituent of body fat. Total cholesterol levels may affect the development of acne, because both adrenal and gonadal androgens are synthetized from cholesterol derived from the plasma [6].

Dietary modification remains the first-line therapy for lower plasma cholesterol [17]. It has been known for a long time that the amount and type of fat in the diet have an effect on blood lipid concentration [18]. Based on patients' reports, we noted that they consume a lot of carbohydrates a day, diet rich in saturated fatty acids and low in polyunsaturated fatty acids, and that they live in persistent stress. Our results indicated that women with acne have significant changes in plasma lipids. We conclude that the measurement of blood lipid levels should be kept in mind when screening women with acne. The proper diet should be recommended as an additional treatment option. It should decrease total energy and animal fat intake and increase the consumption of vegetables and fruit [19].

Conflict of interest

The authors declare no conflict of interest.

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