The Relationship between Blood Lipid Profile and Acne in Non-obese, Non-PCOS Patients

Sheikh Manzoor1, Suhail Rather2, Syed Shahab-ud-din1, Farah Sameen4, Samia Aleem6, Shazia Jeelani6

ABSTRACT
Introduction: Acne vulgaris is a common skin disorder affecting adolescents and young adults. Its pathophysiology includes increased sebum production and sebum analysis in some studies have shown increased triglycerides and wax/cholesterol esters in acne patients. But is this local alteration of surface lipids and seborrhoea associated with any alteration of lipid profile in acne patients?

Material and methods: 150 acne patients and 80 age and sex matched controls were included in study. Fasting lipid profile of acne patients was compared with controls. GAGS was used for grading acne.

Results: The predominant acne grade was grade I (54.67%). 45.34% of Acne patients had deranged lipid profile compared to 30% in controls. Total cholesterol was raised in 17.33% of Acne patients compared to 5% in controls, while the HDL was low in 10.67% of Acne patients compared to 10% of controls. LDL was raised in 8% of Acne patients and 2.5% of the controls. Triglycerides were raised in 33.34% of Acne patients and 20% of controls. Total cholesterol / HDL ratio was raised in 34.67% of Acne patients compared to 15% of controls. There is a statistically significant difference in the level of Total cholesterol, VLDL, triglyceride and total cholesterol: HDL ratio between acne patients and controls. There is a statistically significant rise in levels of LDL, VLDL, Triglyceride and TC/HDL and decrease in levels of HDL with the severity of acne.

Conclusion: Acne patients are more likely to have some abnormality in lipid profile, particularly patients with severe acne. The abnormal lipid profile should be considered in disease pathogenesis and maybe even in treatment.

Keywords: Acne, lipid profile, severity, non-PCOS, non-obese

INTRODUCTION
Acne is chronic inflammatory disease of pilosebaceous unit and is clinically characterized by seborrhoea, open and closed comedones, papules and pustules and in severe cases nodules, deep pustules and pseudocysts. The condition starts after puberty and is a common skin disorder in adolescents and young adults.1 Though excess sebum production is considered prerequisite for development of acne other factors involved in the pathogenesis include hypersecretion of the pilosebaceous duct, colonization of pilosebaceous duct with Propionibacterium acneus and local release of inflammatory mediators.2 Acne subjects not only excrete more sebum the secretion rates have been seen to correlate well with the severity of acne.3 Triglycerides (40-60%), wax esters (19-26%) and squalene (11-15%) are major components of sebum.4 Squalene which is a non-polar hydrocarbon and most unsaturated molecule is present in unusually high levels in sebum.5 Decreased concentration of linoleic acid has been observed in skin surface lipids of acne patients.6 It seems that β-oxidation of linoleic acid is specific of sebocytes and that it is correlated with their differentiation.7 Sebum analysis in some studies have shown increased triglycerides and wax/cholesterol esters in acne patients.8 But is this local alteration of surface lipids and seborrhoea associated with any alteration of lipid profile in acne patients. Alteration in lipid profile of acne patients is not well known, but few studies in both male and female acne patients have shown some alterations. The aim of this study is to evaluate the association of acne with lipid profile.

MATERIAL AND METHODS
The study was conducted in Sher-i-Kashmir Institute of Medical sciences Hospital. 150 cases of acne in age group of 12-35 years and 80 age and sex matched healthy controls attending Dermatology Clinic between 1st August 2015 to 1st October 2015 were included in the study.

Exclusion criteria
1. Obesity
2. History of cardiovascular disease
3. History of dyslipidemia or drugs that affect lipid metabolism
4. Female subjects with PCOS, history of oral contraceptives or hormonal therapy

Informed consent was taken from the subjects. Ethical clearance was obtained from the institute’s ethical clearance committee. Acne grading for each patient was performed by only one dermatologist based on Global Acne Grading System (GAGS).9 This system considers six locations on the face, chest and upper back, with a factor for each location based roughly on the affected surface area, distribution and density of pilosebaceous units. Each grade was calculated as the sum of the local scores for the face, chest and upper back [Table 1]. The subjects chosen in this study were interviewed, and each completed consent and a questionnaire form that contained information about their age, sex, weight, height, personal history of acne, personal or family history of dyslipidemia,

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RESULTS

230 subjects, aged from 12 to 35 years, were enrolled in this study. One hundred and fifty were newly diagnosed untreated acne patients from both sexes, attending Dermatology Clinic in Sher-i-Kashmir Institute of Medical sciences Hospital, with 80 age and sex matched healthy controls.

Age of the subjects varied between 12 to 35 years. The predominant acne grade was grade I (54.67%), followed by grade II (40%) and grade III (5.33%). 45.34% of Acne patients had deranged lipid profile compared to 30% in controls. Total cholesterol was raised in 17.33% of Acne patients compared to 5% in controls, while the HDL was low in 10.67% of Acne patients compared to 10% of controls. LDL was raised in 8% of Acne patients and 2.5% of the controls. VLDL was raised in 8% of Acne patients but none of controls. Triglycerides were raised in 33.34% of Acne patients and 20% of controls. Total cholesterol/HDL ratio was raised in 34.67% of Acne patients compared to 15% of controls.

There is a statistically significant difference in the level of Total cholesterol, VLDL, triglyceride and total cholesterol: HDL ratio between acne patients and controls, as shown in Table 2. The lipid profile, particularly Triglycerides showed progressive derangement with the severity of Acne. There is a statistically significant rise in levels of LDL, VLDL, Triglyceride and TC/HDL and decrease in levels of HDL with the severity of acne, as shown in Table 3, Fig. 1.

DISCUSSION

Acne vulgaris is a chronic inflammatory disease of pilosebaceous unit. It has a multifactorial pathogenesis, but excess sebum production is considered prerequisite for the development of acne.4 Current study showed increase in levels of total cholesterol, VLDL, triglycerides and TC/HDL ratio in acne patients compared to controls. HDL and LDL were comparable in both groups. Jaing et al in their study found increased ratio of total cholesterol and triglycerides in acne patients.12 Similarly Abulnaga and Arora et al in their study conducted on female patients found increased levels of cholesterol in acne patients.13,14 But unlike these studies LDL levels were comparable in both groups in our study, the finding consistent with study conducted by Vergani et al.15 Almost all cholesterol enters sebocytes by the LDL receptor mediated endocytosis and its synthesis within sebocytes is interrupted at the level of squalene.16 Increased serum Total cholesterol levels may affect the development of acne vulgaris by increasing androgens, as both adrenal and gonadal androgens are synthesized from plasma cholesterol.17 Exogenous fatty acids from lipoproteins is released within cells by lipoprotein lipase, which has been shown to be expressed in sebaceous glands at mRNA level, de novo synthesis oc-

**Table 1: The global acne grading system**

<table>
<thead>
<tr>
<th>Location</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forehead</td>
<td>2</td>
</tr>
<tr>
<td>Left cheek</td>
<td>2</td>
</tr>
<tr>
<td>Chin</td>
<td>1</td>
</tr>
<tr>
<td>Right cheek</td>
<td>2</td>
</tr>
<tr>
<td>Nose</td>
<td>1</td>
</tr>
<tr>
<td>Chest and upper back</td>
<td>3</td>
</tr>
</tbody>
</table>

Calculation: Each type of lesion is given a value depending on severity: no lesions=0, comedones=1, papules=2, pustules=3 and nodules=4. The score for each area (local score) is calculated using the formula: Local score=Factor×grade (0-4). The global score is the sum of local scores and acne severity was graded using the global score. A score of 1-18 is considered mild, 19-30, moderate; 31-38, severe; and >39, very severe.

**Table 2: Comparison of lipid profile between controls and acne patients.**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Controls</th>
<th>Acne patients</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>151.25±32.40</td>
<td>167.87±38.04</td>
<td>0.0011*</td>
</tr>
<tr>
<td>HDL</td>
<td>50.10±12.72</td>
<td>50.4±9.66</td>
<td>0.8414</td>
</tr>
<tr>
<td>LDL</td>
<td>78.45±16.56</td>
<td>80.49±31.16</td>
<td>0.5859</td>
</tr>
<tr>
<td>VLDL</td>
<td>20.63±5.99</td>
<td>25.04±12.91</td>
<td>0.0044*</td>
</tr>
<tr>
<td>TG</td>
<td>112.70±36.62</td>
<td>127.45±59.91</td>
<td>0.0456*</td>
</tr>
<tr>
<td>TC/HDL</td>
<td>3.18±0.81</td>
<td>3.43±0.96</td>
<td>0.0486*</td>
</tr>
</tbody>
</table>

Data are presented as mean±SD, *represents P<0.05.

**Table 3**

Before blood samples were collected. Subjects were fasting 12–14 hr at the time of blood withdrawal. Venous blood specimens were collected in ethylenediaminetetraacetic acid (EDTA) tubes, then immediately centrifuged using low speed refrigerated centrifuge 1500. In suspected cases of PCOS hormonal profile and ovarian ultrasonography was done. The American Association of Clinical Endocrinologists (AACE), American College of Endocrinology (ACE), and Androgen Excess and PCOS Society (AES) released guidelines were used in the diagnosis of PCOS.10 Patients with Body Mass Index more than 30 kg/m² were excluded from the study.

**Dyslipidemia:** National Cholesterol Education Programme (NCEP) guidelines11 were used for definition of dyslipidemia as follows:

- **Hypercholesterolemia** – serum cholesterol levels ≥200 mg/dl (≥5.2 mmol/l).
- **Hypertriglyceridemia** – serum triglyceride levels ≥150 mg/dl (≥1.7 mmol/l).
- **Low HDL cholesterol** – HDL cholesterol levels <40 mg/dl (<1.04 mmol/l).
- **High LDL cholesterol** – LDL cholesterol levels ≥130 mg/dl (≥3.4 mmol/l) calculated using the Friedewald equation.
- **High VLDL** —50mg/dl
- **High total cholesterol to HDL-C ratio:** This is defined as total cholesterol to HDL ratio of ≥4.5.

TC, HDL, and TG were determined using an enzymatic colorimetric test, which measured oxidase and peroxidase activities. LDL and VLDL values were calculated by the Friedewald formula.

**STATISTICAL ANALYSIS**

Results were collected, tabulated and statistically analyzed by SPSS version 11. Data were described in terms of mean ± SD, frequencies and relative frequencies. For comparison Student’s t-test and ANOVA (F-test) was used. P< 0.05 was considered to be statistically significant.

**DISCUSSION**

Acne vulgaris is a chronic inflammatory disease of pilosebaceous unit. It has a multifactorial pathogenesis, but excess sebum production is considered prerequisite for the development of acne.4 Current study showed increase in levels of total cholesterol, VLDL, triglycerides and TC/HDL ratio in acne patients compared to controls. HDL and LDL were comparable in both groups. Jaing et al in their study found increased ratio of total cholesterol and triglycerides in acne patients.12 Similarly Abulnaga and Arora et al in their study conducted on female patients found increased levels of cholesterol in acne patients.13,14 But unlike these studies LDL levels were comparable in both groups in our study, the finding consistent with study conducted by Vergani et al.15 Almost all cholesterol enters sebocytes by the LDL receptor mediated endocytosis and its synthesis within sebocytes is interrupted at the level of squalene.16 Increased serum Total cholesterol levels may affect the development of acne vulgaris by increasing androgens, as both adrenal and gonadal androgens are synthesized from plasma cholesterol.17 Exogenous fatty acids from lipoproteins is released within cells by lipoprotein lipase, which has been shown to be expressed in sebaceous glands at mRNA level, de novo synthesis oc-

![International Journal of Contemporary Medical Research](image-url)
There are also studies claiming that...

Pigatto et al in their study found that...

Eisinger M. Sebum analy...

Vergani and Finzi et al had similar observation in their study showed statistically significant decrease with severity of acne, particularly triglycerides and TC/HDL ratio. HDL levels showed statistically significant decrease with severity of acne. Vergani and Finzi et al had similar observation in their study where patients with severe acne had significantly reduced levels of HDL compared with healthy individuals. Similar observations were made by Cunha et al in their study on female patients. Pigatto et al in their study found that HDL levels even returned to normal at the end of treatment with Isotretinoin. 

In conclusion, acne patients are more likely to have some abnormality in lipid profile, particularly patients with severe acne. The abnormal lipid profile should be considered in disease pathogenesis and maybe even in treatment.

REFERENCES


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