

The Relationship between Blood Lipids Profile and Acne

Zeyad El-Akawi,^{*,a} Nisreen Abdel-Latif,^b
Khalid Abdul-Razzak,^c
and Mustafa Al-Aboosi^d

^aDepartment of Biochemistry and Molecular Biology, Faculty of Medicine, ^bClinical Biochemistry, Department of Laboratory Sciences, Faculty of Applied Medical Sciences, ^cDepartment of Clinical Pharmacy, Faculty of Pharmacy, ^dDepartment of Internal Medicine (Dermatology), Faculty of Medicine, Jordan University of Science and Technology, P. O. Box 3030, Irbid 22110, Jordan

(Received April 6, 2007; Accepted June 19, 2007)

Minimal reports are available on the relationship between blood lipids such as cholesterol, triglycerides, high-density lipoprotein cholesterol (HDL-C) and low density lipoprotein cholesterol (LDL-C) and acne. Most of available literature was about the effect of drugs used in acne treatment on these parameters. In this work we determined plasma total cholesterol, triglycerides, HDL-C and LDL-C levels in 166 (83 males and 83 females) newly diagnosed untreated Jordanian acne patients and compared with 105 (52 males and 53 females) of age and sex matched healthy controls. Results indicated that acne patients, males and females, had significantly low plasma HDL-C levels ($p = 0.000$). Plasma total cholesterol, triglycerides and LDL-C levels were shown to be within the normal range except for triglycerides and LDL-C levels in severe acne cases for both sexes, were shown to be significantly elevated compared with those in healthy controls ($p = 0.004$ and 0.000 consequently). It has been noticed that there was a trend for plasma HDL-C of acne patients to decrease as the severity of acne condition increases. Our results indicated that acne patients have significant changes in the plasma lipids profile that should be considered in the pathogenesis as well as in the treatment of acne.

Key words—acne, cholesterol, triglyceride, high density lipoprotein cholesterol, low density lipoprotein cholesterol

*To whom correspondence should be addressed: Department of Biochemistry and Molecular Biology, Faculty of Medicine, Jordan University of Science and Technology, P. O. Box 3030, Irbid 22110, Jordan. Tel.: +962-2-7201000 (ext. 23837); Fax: +962-2-7201064; E-mail: zakawi@just.edu.jo

INTRODUCTION

Little is known about the relationship between lipoproteins and skin diseases. Vergani and Finzi *et al.* showed a significant reduction in high-density lipoprotein cholesterol (HDL-C) and apoprotein A-I levels in 12 male patients with severe cystic acne compared with those of age-matched controls. In the same study, no significant differences were found in the plasma triglycerides and total cholesterol levels.¹⁾

Plasma HDL-C, apoprotein A-I and HDL₂ subclass levels in a large number of patients with severe cystic acne were shown to be significantly lower than those in either matched controls or individuals with acne vulgaris.²⁾ Present study was designed to evaluate the relationship between blood lipids profile and acne in the Jordanian acne patients.

MATERIALS AND METHODS

Two hundreds and seventy-one subjects, ages from 13 to 42 years, were enrolled in this study. One hundred and sixty-six were newly diagnosed untreated acne patients from both sexes, either attending Dermatology Clinic in Princess Basma Teaching Hospital or they were students at Jordan University of Science and Technology attending King Abdullah The Second Teaching Hospital in Irbid. Acne grading for each patient was performed by only one dermatologist based on Global Acne Grading System (GAGS).³⁾ 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.

The other one hundred and five subjects were age and sex matched healthy volunteers as controls. They were not taken any medicine and had no personal nor family history of acne. The subjects chosen in this study were interviewed, and each completed consent and a questionnaire form that contained information about their age, sex, weight, personal or familial history of acne, and eating habits 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 $1500 \times g$ for

30 min at 4°C. Plasma was separated within one hr after blood sample collection and kept frozen at -20°C until analysis.

Plasma total cholesterol, triglycerides, high and low density lipoproteins cholesterol levels were estimated by enzymatic colorimetric tests commercially available (RANDOX, Crumlin, U.K.) according to the manufacturer recommended procedure. Plasma lipids concentrations were determined using Shimadzu micro-flow spectrophotometer (CL-750, Shimadzu, Tokyo, Japan).

Statistical analysis of the data was performed using the statistical package for the social science (SPSS) program. Results were expressed as mean \pm standard deviation. *t*-test was used to compare the significance of the mean differences between two groups. The differences were considered significant if the obtained *p* value was less than or equal to 0.05. One-way analysis of variance test was also used for the comparison between more than two mean groups.

RESULTS

One hundred and sixty-six acne patients and 105 age and sex matched healthy controls were included in this study. The age of both, acne patients and controls was ranged from 13 to 42 years. The mean age of acne patients and controls were 20.5 ± 5.0 and 21.7 ± 5.3 years, respectively. The mean weight of acne patients was 64.5 kg, whereas the mean weight of controls was 63.4 kg (Table 1). Acne patients were divided into three groups according to the severity of their acne condition using GAGS. Overall, of these acne patients, sixty-seven (40.4%) had mild acne, seventy-four (44.6%) had moderate acne and twenty-five (15%) had severe grade of

acne. The mild and moderate grades of acne were shown to be more common than the severe grade among acne patients.

Because there are some differences in lipids profile between males and females, in this work we decided to present and analyze results obtained as two groups female and male acne patients and these results were compared with those of age and sex matched healthy individuals. Plasma cholesterol analysis showed that there were no significant differences in plasma total cholesterol levels between acne patients and controls. As shown in Table 2, plasma total cholesterol levels in male and female acne patients were 4.37 ± 0.18 and 4.29 ± 0.11 mmol/l, respectively compared with those of controls 4.38 ± 0.10 and 4.28 ± 0.05 mmol/l, correspondingly. Triglyceride and low density lipoprotein cholesterol (LDL-C) plasma levels were also showed no significant difference in both sexes between acne patients and controls. Only HDL-C levels as demonstrated in Table 2 were significantly lower in acne patients of both sexes compared with those of age and sex matched healthy individuals. HDL-C levels in male and female acne patients were 1.05 ± 0.06 and 1.09 ± 0.03 mmol/l respectively, and in controls were 1.09 ± 0.01 and 1.11 ± 0.02 mmol/l correspondingly. Table 3 demonstrated the plasma lipids profile in male and female patients with different grades of acne and their age and sex matched healthy controls. In this table we see that there was no significant difference in cholesterol levels in patients with all three acne grades (mild, moderate and severe) compared with those of healthy controls. On the other hand LDL-C was shown to be significantly elevated in acne patients with all three grades compared with those of controls except those for female acne patients with mild grade where we observed no significant differ-

Table 1. Age and Weight Analysis of Acne Patients and Controls

	<i>n</i> ^{a)}	Age (years)		Weight (kg)	
		Range	Average \pm S.D.	Range	Average \pm S.D.
Acne Patients					
Males	83	(14-42)	20.0 ± 5.5	(42-110)	68.1 ± 8.5
Females	83	(13-34)	21.0 ± 4.5	(42- 95)	60.8 ± 4.6
Total	166	(13-42)	20.5 ± 5.0	(42-110)	64.5 ± 6.6
Controls					
Males	52	(14-42)	23.5 ± 5.7	(45-95)	69.7 ± 6.4
Females	53	(13-34)	20.0 ± 4.8	(41-80)	57.0 ± 4.8
Total	105	(13-42)	21.8 ± 5.3 ^{b)}	(41-95)	63.4 ± 5.6 ^{c)}

a) *n* = number of subjects, b) *p* = 0.06, *p* = 0.11.

Table 2. Plasma Lipids Profile of Males and Females, Acne Patients and Controls

Parameters (mmol/l)	Males			Females		
	Acne (<i>n</i> = 83)	Control (<i>n</i> = 52)	<i>p</i> Value	Acne (<i>n</i> = 83)	Control (<i>n</i> = 53)	<i>p</i> Value
TC	4.37 ± 0.18	4.36 ± 0.10	0.594	4.29 ± 0.11	4.28 ± 0.05	0.871
TG	0.88 ± 0.15	0.84 ± 0.08	0.130	0.77 ± 0.06	0.78 ± 0.03	0.723
HDL-C	1.05 ± 0.06	1.09 ± 0.01	0.000*	1.09 ± 0.03	1.11 ± 0.02	0.001*
LDL-C	2.90 ± 0.10	2.87 ± 0.05	0.290	2.84 ± 0.09	2.82 ± 0.04	0.149

Results are presented as mean ± S.D., where *n* is the number of individuals. TC: total cholesterol, TG: triglycerides, HDL-C: high density lipoprotein cholesterol, LDL-C: low density lipoprotein cholesterol. Significant differences are indicated by **p* ≤ 0.05.

Table 3. Plasma Lipids Profile of Patients and Controls with Different Grades of Acne

Parameters (mmol/l)	Males						
	Control	Mild acne	<i>p</i> Value	Moderate acne	<i>p</i> Value	Severe acne	<i>p</i> Value
N	52	33		35		15	
TC	4.36 ± 0.10	4.38 ± 0.17	0.934	4.39 ± 0.21	0.404	4.33 ± 0.06	0.286
TG	0.84 ± 0.08	0.87 ± 0.10	0.295	0.89 ± 0.27	0.243	0.91 ± 0.06	0.004*
HDL-C	1.09 ± 0.01	1.08 ± 0.01	0.792	1.07 ± 0.03	0.000*	0.95 ± 0.06	0.000*
LDL-C	2.87 ± 0.05	2.88 ± 0.08	0.933	2.90 ± 0.12	0.117	2.95 ± 0.05	0.000*
Parameters (mmol/l)	Females						
	Control	Mild acne	<i>p</i> Value	Moderate acne	<i>p</i> Value	Severe acne	<i>p</i> Value
N	53	34		39		10	
TC	4.28 ± 0.05	4.28 ± 0.09	0.934	4.29 ± 0.13	0.897	4.33 ± 0.06	0.286
TG	0.78 ± 0.03	0.77 ± 0.05	0.295	0.79 ± 0.07	0.512	0.91 ± 0.06	0.004*
HDL-C	1.11 ± 0.02	1.11 ± 0.02	0.792	1.10 ± 0.01	0.000*	0.95 ± 0.06	0.000*
LDL-C	2.82 ± 0.04	2.82 ± 0.08	0.933	2.84 ± 0.11	0.187	2.95 ± 0.05	0.000*

Results are presented as mean ± S.D., where N is the number of individuals. TC: total cholesterol, TG: triglycerides, HDL-C: high density lipoprotein cholesterol, LDL-C: low density lipoprotein cholesterol. Significant differences are indicated by **p* ≤ 0.05.

ence compared with those of healthy controls. Concerning triglycerides there was no significant difference between acne patients with mild and moderate grades compared with those of controls. In patients with severe grade of acne, triglyceride levels were shown to be significantly higher than those of healthy controls as demonstrated in Table 3.

In addition, in Table 3 we demonstrated how the plasma lipids profile behave in acne patients going from mild to moderate and to severe grades of acne. As shown in Table 3, plasma total cholesterol levels were not changed significantly as the severity of acne condition increased in both male and female acne patients. Plasma triglycerides levels in both male and female acne patients were increased from mild to moderate and from moderate to severe grades. This increase was not statistically significant. There was a trend for plasma HDL-C levels to significantly decrease as the severity of acne increases, this trend was observed in both male and female acne patients (*p* = 0.000). Plasma LDL-C

levels in male acne patients tend to increase as the severity of acne increases, and this increase was statistically significant (*p* < 0.05). In female acne patients the same was observed, but this increase was not significant (*p* > 0.05).

DISCUSSION

The relationship between blood lipids such as cholesterol, triglycerides, HDL-C and LDL-C and acne is not widely reported. Measuring plasma total cholesterol, triglycerides, HDL-C and LDL-C levels in 166 Jordanian acne patients we demonstrated that acne male patients as well as females have significantly low plasma HDL-C levels compared with those of age and sex matched healthy controls. These results came to confirm what has been observed by Vergani and Finzi *et al.*¹⁾ They found that males with severe acne have significantly reduced levels of HDL-C compared with those of

healthy individuals. The mean plasma total cholesterol, triglycerides and LDL-C levels in males and females were found not to be significantly different from those of healthy controls, except that for LDL-C levels in patients with severe grades of acne, where we observed a significant decrease in this parameter compared with controls. Obtained results concerning plasma total cholesterol and triglycerides were similar to those demonstrated by Vergani and Finzi *et al.* where they did not find any significant differences in the triglyceride and total cholesterol levels between patients and controls.¹⁾

Serum lipids concentration are affected by many factors such as environmental factors, alcohol intake, smoking, dietary intake and genetic factors. Therefore, we might find some differences in these levels between different races and ethnic groups.⁴⁾ It has been observed that saturated fatty acids elevate plasma triglycerides and LDL-C levels, and carbohydrates lower the plasma HDL-C levels.²⁾ In our work, taking the dietary factor, we found that most acne patients in Jordan consumed foods rich in carbohydrates, saturated fatty acids and low in polyunsaturated fatty acids and this might lead to marked changes in the fat composition of HDL and LDL lipoproteins, which might reflected on their plasma levels.⁵⁾ Therefore, the above stated facts might partially explain the obtained results concerning LDL-

C and HDL-C levels.

In conclusion, acne patients have some abnormality in the lipid profile. This abnormality that we demonstrated in this study might due to different factors that must be considered in the pathogenesis as well as in the treatment of acne patients.

REFERENCES

- 1) Vergani, C., Finzi, A. F., Pigatto, P. D., Viogotti, G., Nergi, M. and Altomare, G. F. (1982) Low level of HDL in severe cystic acne. *N. Engl. J. Med.*, **307**, 1151–1152.
- 2) Pigatto, P., Altomare, G. F., Negri, M., Finzi, F. A., Vigotti, G. and Vergani, C. (1985) Lipoprotein metabolism and lipoprotein lipase in severe cystic acne. *Dermatologica*, **171**, 243–246.
- 3) Doshi, A., Zaheer, A. and Stiller, M. J. (1997) A comparison of current acne grading systems and proposal of a novel system. *Int. J. Dermatol.*, **6**, 416–418.
- 4) Kuller, L. H. (2004) Ethnic differences in atherosclerosis, cardiovascular disease and lipid metabolism. *Curr. Opin. Lipidol.*, **15**, 109–113.
- 5) El-Akawi, Z., Abdel-Latif, N., Abdel-Razzak, K. and Al-Aboosi, M. (2006) Factors believed by Jordanian acne patients to affect their acne condition. *East. Mediterr. Health J.*, **12**, 840–846.