Pattern of skin surface lipids in some South-Western Nigerians with acne vulgaris

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Summary

Unanswered questions still exist regarding pathophysiology of acne vulgaris generally and particularly in this environment.

Methods: Skin surface lipid (SSL) samples were collected by the heptane sponge technique from faces of 20 Nigerians with facial acne vulgaris and 25 controls. The subjects were classified into mild and moderately severe acne groups. Total cholesterol and triglycerides were determined and expressed in percentage (%) while Undetermined Skin Surface Lipids (USSL) (free fatty acids + squalene + wax ester + diglycerides) were computed.

Results: Triglycerides and total cholesterol levels were significantly higher in subjects with acne vulgaris compared with controls (p < 0.001 and p <0.029 respectively). There was a progressively significant increase in triglycerides from control, though mild to moderately severe acne vulgaris subjects (P < 0.01) in all cases. In contrast there was a significant progressive decrease in USSL among the three groups (P < 0.001) in all cases. No significant difference was evident for all the values on comparison of female subjects with male subjects. There were however, significant increases in triglycerides and significant decreases in USSL levels for both male and female subjects with acne vulgaris compared with their respective controls (P <0.02, P < 0.01, P <0.03 and P < 0.014).

Conclusion: Alterations in composition of SSL may in part be the pathophysiological basis of inflammatory acne vulgaris. Severity of the disorder appears to parallel triglyceride level but there was no association with sex. Triglycerides and total cholesterol levels are lower in SSL in this environment compared with hotter climates.

Keywords: *Acne vulgaris, Skin surface lipids (SSL), Triglycerides, Total cholesterol, USSL.*

Résumé

Introduction: Des questions sans reponses existent encore en ce qui concerne la pathophysiologie de l' acné vulgarise en général et dans ce milieu en particulier.

Méthodes: Les prélèvements des lipides de la surface de la peau (SSL) ont été collectionnés dans les figures de 20 Nigerianss atteints de l'acné vulgarise faciale et 25 controls a travers la méthode héptane éponge. Les patients ont été classés en groupe de l'acné moyenne et sévèrement modérée. Le cholestérol total et les triglycérides ont été décides et experimes en pour centage (%) alors que les lipides de la surface de la peau non déterminées (USSL) (l'acide grass libre + squalene + ester gras + diglycérides) ont été calcutés.

Résultats: Des triglycérides et le niveau total du cholestérol étaient manifestement plus élevés chez les patients avec l'acné vulgarise par rapport aux contrôls (P <0,001 et P < 0,029 res-

pectivement). Il y avait une augmentation importante progressive en matiere des triglycérides dans le contrôl, chez des sujets de moyen a l'acne vulgarise sévère (P < 0,01) dans tous les cas. Par contrast, il y avait une diminuition progressive importane en matière de IUSSL parmi les trios groupes (P < 0,001) dans tous les cas. Aucune différence importante était indiquée pour toutes les valeurs quant on avait comparé les patients femmes avec les patients hommes. Toutefois, il y avait une augmentation importante dans les triglycérides et une diminution importance dans les nineaux de l'USSL pour patients hommes et femmes, les deux, avec l'acné vulgarise par rapport a leurs contrôls respective (P < 0,2, P < 0,03, et P <0,014).

Conclusion: Changement apporté a la composition de SSL pourrait en partie être la base pathophysiologique de l'acné vulgarise inflammatoire. La séverité du trouble parrait etre au même niveau avec la triglycéride mais il n'y avait aucune association avec le sexe. Les niveaux des triglycérioles et cholestérol total sont en baisse en ce qui concerne SSL dans ce milieu par rapport avec des climates plus chaud.

Introduction

Many questions still remain unanswered on the pathophysiology of Acne vulgaris.[1] Over 80% of adolescents suffer from Acne vulgaris.[2,3] Post- adolescent acne vulgaris represent an increasingly important population of acne vulgaris sufferer.[2,3] Etiological factors of acne vulgaris are excessive sebum production, hyperkeratinization of the pilosebaceous duct follicles and bacterial colonization with propionibacterium acne.[4,5,6,7] The contribution of sebum has been exploited in therapeutic agents for the suppression of acne vulgaris. Sebum is the main source of SSL.[8,9] Climatic conditions may affect the evolution of acne vulgaris.[10] Previous reports were carried out in Saudi Arabia with dry warm tropical climate,[10] and in Europe and North America with temperate climate.[11] However, there are no reports on the composition of skin surface lipid and its relationship to the development of acne vulgaris from a humid warm tropical climate such as is found in the South-Western part of Nigeria. There are conflicting reports on racial and ethnic differences in the severity of acne vulgaris. Additionally, in this sub region, there is paucity of reports on the prevalence of acne vulgaris. This study was therefore conceived to address this gap in knowledge.

Materials and subjects
Subjects

Twenty (9 males, 11 females) subjects with facial acne vulgaris were selected and grouped into mild acne and moderately severe acne according to the modified system of Leeds.[14,15] This method was based on counting inflamed lesions, non-inflamed lesions and scars (mild ≤ 20, moder-

ately severe > 20 to ≤ 40, severe > 40 to ≤ 80 and very severe > 80).

Twenty-five (15 males, 10 females) subjects without facial acne vulgaris were selected as controls. Both patient and control groups were age matched (range 18 to 32 years). The exclusive criteria for both groups were manifestation of any other skin disease such as eczema, ringworm or any form of dermatitis.

Collection and extraction of SSL samples

The selection site for the subjects was Medical Hostels of UCH, Ibadan. Skin surface lipids samples were collected using sponge soaked in heptane from all 45 subjects according to the modified method of Zohiar et al,[10] within 4 - 12 hours after the subject last had a bath. All subjects were instructed not to apply face cosmetics on the day of sample collection. The lipid contents of the samples were recovered from the sponge by extraction with heptane of analytical grade (Hopkins and Williams Ltd., England) using the modified method described by Zohiar et al.[10]

The solvent was allowed to evaporate at room temperature within 30 minutes in a shallow watch glass of known weight. The lipid extract and the container were measured using single pan electronic balance (Metler AE 240, Metler England). The difference in weight of the container gives the weight of the dried lipid extract. The weighed lipid residues were reconstituted with sufficient volumes (ml) of heptane to give 1mg lipid/ml as described previously,[10] which was employed as the working sample.

Method

The total cholesterol and triglyceride concentrations of the lipid extract were determined within one hour using the modified enzymatic methods of Alain et al, [16] and Buccolo and David[17] respectively employing chemical kits supplied by Human (Human Diagnostica, Germany).

Humatrol, quality control samples (Human Diagnostica, Germany) were used for quality assessment. The controls were included in each batch of analysis. The undetermined lipid fractions were computed by subtracting the sum of total cholesterol and triglyceride from 100% as previously described by Zohair et al.[10] (1mg lipid/ml = 100%)

Statistical analysis

Data obtained were subjected to statistical analysis. Means, standard deviations and students t-tests were computed using SAS statistical package (SAS Institute Inc., Cary, NC). Results were expressed as Mean ± SD. Data were also subjected to one way analysis of variance (ANOVA). The 5% (P <0.05) level of significance was adopted for significant findings.

Result

Tables 1 to 5 show the results obtained from this study.

Table 1 Triglycerides, total cholesterol and undetermined skin surface lipids in subjects with acne vulgaris and controls

Composition of SSL	Subjects with acne vulgaris (n = 20)	Controls (n = 25)	T	P
Triglycerides (%)	30.7 ± 0.5	25.2 ± 2.1	4.019	<0.001
Total cholesterol (%)	3.4 ± 1.3	2.7 ± 0.9	2.241	< 0.029
Undetermined (%)	66.1 ± 4.5	72.1 ± 0.6	3.771	< 0.001

Values are means ± SD

Table 2 Triglycerides total cholesterol and undetermined skin surface lipids in subjects with moderately severe acne vulgaris, mild acne vulgaris and controls

Composition of SSL	Subjects with moderately severe acne vulgaris (n = 9)	Subject with mild acne vulgaris (n = 11)	Controls (n = 25)	F	P
Triglycerides (%)	32.5 ± 3.8	29.3 ± 3.4	25.2 ± 2.1	9.627	<0.01
Total cholesterol (%)	3.6 ± 0.8	3.3 ± 1.7	2.7 ± 0.9	2.648	>0.08
Undetermined (%)	63.9 ± 4.2	67.9 ± 3.9	72.1 ± 0.6	9.030	<0.001

Values are means ± SD

Table 3 Triglycerides, total cholesterol and undetermined skin surface lipids in male subjects with acne vulgaris and male controls

Composition of SSL	Male subjects with acne vulgaris (n = 9)	Male controls (n = 15)	T	P
Triglycerides (%)	29.0 ± 3.5	24.5 ± 4.7	2.482	<0.020
Total cholesterol (%)	3.4 ± 1.8	2.5 ± 0.9	1.673	> 0.105
Undetermined (%)	68.2 ± 4.0	73.0 ± 0.5	2.289	<0.030

Values are means ± SD

Subjects with acne vs controls

Triglyceride level was significantly increased in patients compared with controls (P < 0.001). Total cholesterol was similarly increased in subjects with acne vulgaris compared with controls (p < 0.029). In contrast there was a significant decrease in the level of undetermined lipids in acne vulgaris sufferers compared with control (P < 0.001) (table 1).

Moderately severe acne, mild acne subjects vs controls

There was a significant progressive increase in the levels of triglycerides from controls to the moderately severe group (P < 0.01) (table 2). No similar observation was evident in total cholesterol when the three groups were compared (P > 0.05) in all cases. A trend opposite to that of triglycerides was also evident when undetermined lipid levels were compared in all three groups (P < 0.001).

Male subjects with acne vulgaris vs male controls

Comparison of skin surface reveals that triglyceride level was significantly higher in male subjects with acne vulgaris than in controls (P < 0.02). There was no significant difference in total cholesterol level in

Table 4 Triglycerides, total cholesterol and undetermined skin surface lipids in female subjects with acne vulgaris and female controls

Composition of SSL	Female subjects with acne vulgaris (n = 11)	Female Controls (n = 10)	T	P
Triglycerides (%)	32.1 ± 3.7	26.3 ± 5.6	2.836	< 0.010
Total cholesterol (%)	3.4 ± 0.8	3.0 ± 0.9	1.274	> 0.21
Undetermined (%)	64.4 ± 4.2	70.6 ± 6.1	2.287	< 0.014

Values are means ± SD

Table 5 Triglycerides, total cholesterol and undetermined skin surface lipids in male and female subjects with acne vulgaris

Composition of SSL	Male subjects with acne vulgaris (n = 9)	Female subjects with acne vulgaris (n = 11)	T	P
Triglycerides (%)	29.0 ± 3.5	32.1 ± 3.7	1.929	> 0.067
Total cholesterol (%)	3.4 ± 1.8	3.4 ± 0.8	0.008	> 0.989
Undetermined (%)	68.2 ± 4.0	64.4 ± 4.2	2.0543	> 0.053

Values are means ± SD

Key:
SSL   -   *Skin surface lipids*
Undetermined -   *Free fatty acid + Squalene + wax esters + diglycerides*

male subjects with acne compared with male controls (P > 0.05). The level of undetermined lipids in male subjects with acne was also significiantly lower than in male controls (P < 0.03) (table 3).

Female subjects with acne vulgaris vs female controls

The level of total cholesterol was similar in both female patients and controls (P > 0.05). Like the male acne sufferers there was significant increase in the level of triglycerides when the two groups were compared (P < 0.01) (table 4). Again as in the male acne vulgaris patients the level of undetermined lipids was significantly lower in female patients than controls (P < 0.014).

Female patients vs male patients

The levels of total cholesterol, triglycerides and undetermined lipids in female patient were not significantly different from those of male acne vulgaris patients (P > 0.05) in all cases (table 5).

Discussion

Acne vulgaris has been associated with disorder of the sebaceous glands of the skin.[8] Data from this study indicate significant elevations in skin surface cholesterol, triglyceride and reduction in USSL in patients with acne vulgaris compared to controls. The significant increase in both triglycerides and total cholesterol imply that both contributed to the development of acne vulgaris in the subjects. This corroborates the earlier reports that acne vulgaris results from excessive production of sebum, which is a secretion of the sebaceous gland of the skin.[4, 5, 6, 7]

Additionally, there was progressive statistically significant elevations of triglycerides and non-significant progres-

sive elevation of total cholesterol in controls, mild and moderately severe acne vulgaris. This further implicates skin surface triglycerides in the development and severity of acne vulgaris. An observation earlier made by Milton et al.,[8] that glandular activity of sebaceous gland is higher in those with acne vulgaris than in normal individuals.

It was also observed in this report that there was no statistically significant difference in the mean values for triglycerides, total cholesterol and USSL in female subjects with acne vulgaris compared with their male counterparts. This may suggest that gender may not be a contributory factor in the prevalence and severity of acne vulgaris.

The mean triglyceride and total cholesterol levels found in the female and male subjects without acne vulgaris were 26.3%, 3.0% and 24.5%, 2.5% respectively. These values were lower than the values reported by Zohair et al,[10] in hotter but less humid environments. These investigators reported that Saudi females and males have triglycerides and total cholesterol values of 37.6%, 4.3% and 33.6%, 3.9% respectively. The lower triglycerides values found in this environment in this current report may be as a result of increase in lipolysis of triglycerides converting some to diglycerides and free fatty acids by bacteria. Kellum[18] and Thomas et al [19] have noted that skin surface triglycerides are converted to free fatty acids and diglycerides by the process of lipolysis through bacterial action. The bacterial lipolytic action might be favoured in this warm and humid environment as humidity favours bacterial growth.[20]

It appears that alteration in the composition of human skin surface lipids may be related to the development of inflammatory acne vulgaris in this environment. The severity of the disease appears to parallel increase in triglycerides level, but there is no association with sex. Furthermore, triglycerides and total cholesterol have lower values in the composition of skin surface lipids in this environment compared with those in hotter less humid climates such as Saudi Arabia. The implications are not clear at the moment.

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