



International Journal of Dermatology, Venereology and Leprosy Sciences

E-ISSN: 2664-942X

P-ISSN: 2664-9411

www.dermatologypaper.com

Derma 2021; 4(2): 34-38

Received: 23-06-2021

Accepted: 26-07-2021

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An observational study of co-relation of acne and metabolic syndrome

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DOI: <https://doi.org/10.33545/26649411.2021.v4.i2a.89>

Abstract

Background: Acne vulgaris remains one of the commonest diseases of skin with chronic inflammatory dermatosis that affects 85 p.c of the adolescents and young adults globally. Acne is associated with greater psychological burden that include depression, anxiety, and low self-esteem. It is a multifactorial disease depending on genetic predisposition, follicular epidermal hyperproliferation, endocrine factors, the colonization and activity of Propionibacterium acnes, excess sebum production, inflammation, and environmental factors. Insulin resistance, dyslipidaemia, visceral adiposity, elevated blood pressure and chronic stress are several factors which constitute the metabolic syndrome.

Aim & Objectives: To analyse the relationship between Diabetes Mellitus, Dyslipidaemia, Hypertension, and Visceral Adiposity in Acne Vulgaris.

Material and Methods: A hospital based, analytical cross-sectional study was conducted among patients aged 14 years & above, irrespective of gender with acne vulgaris, irrespective of severity and attend the outpatient clinic of dermatology at a tertiary care hospital for a period of 12 months. Grading of acne was done according to Global Acne Grading System. Metabolic syndrome was diagnosed as per the criteria of the modified NCEP-ATP III.

Results: The patients with severe GAGS had high metabolic syndrome (72.4%) when compared to those without metabolic syndrome (27.6%), there exists an extreme statistically significant association between metabolic syndrome and GAGS (acne severity) with p-value <0.001.

Conclusion: HDL has high influence on acne vulgaris when compared to waist circumference, triglyceride, fasting blood sugar, and blood pressure.

Keywords: Acne, dyslipidemia, GAGS, HDL, metabolic syndrome

Introduction

Acne vulgaris (acne) is considered as one of the most commonly encountered dermatoses seen in clinical practice ^[1]. Acne vulgaris is the disease afflicting humanity and most commonly treated by physicians ^[2]. It is a pilosebaceous gland disease which usually affects people from puberty to early adulthood ^[3]. It is a common chronic inflammatory dermatosis that affects almost 85% of adolescents and young adults globally ^[4]. The prevalence of acne in adults is also rapidly increasing ^[5]. Reportedly, Acne vulgaris is affecting 2/3rd of adults of age 18 and above ^[6]. The most severe forms of acne vulgaris occur in males more frequently, but in females the disease tends to be more persistent ^[7]. Acne is associated with certain psychological ailments that include depression, anxiety, and low self-esteem ^[8].

Acne is characterized by seborrhoea, open & closed comedones, pustules, erythematous papules, and in more severe cases it is characterised by nodules, deep pustules and occasionally pseudocysts ^[9]. Acne is multifactorial, depending on genetic predisposition, endocrine factors, hyperproliferation of follicular epidermis, excessive production of sebum, inflammation, colonization by Propionibacterium acnes, and environmental factors ^[9]. Certain factors have been proposed to cause precipitation or aggravation of acne which includes cosmetics, drugs, sunlight, and seasonal variation ^[9]. Stress is frequently implicated factor in aggravating acne, however acne itself induces stress ^[8]. Recent studies suggest that diet plays a major role in the pathogenesis of acne ^[10].

Presence of acne beyond the age of 25 years has been traditionally defined as Adult acne ^[11]. Adult acne is classified as persistent acne and late-onset acne. Adolescent acne persisting beyond the age of 25 years is known to be persistent adult acne and acne developing for the first time after the age of 25 years is known as late-onset adult acne ^[11].

In persistent acne, patients have lesions on most of the days and may also experience a premenstrual flare ^[11]. Late-onset acne is further subdivided into chin acne, which occurs around the chin and perioral area, it is of inflammatory origin, and premenstrual flares and sporadic acne which occurs suddenly in adulthood without any specific distinguishing features ^[11].

Metabolic syndrome is defined as a constellation of interconnected biochemical, physiological, metabolic & clinical factors with increased risk of cardiovascular disease & type-2 Diabetes Mellitus ^[12]. Insulin resistance, visceral adiposity, dyslipidaemia, hypertension and chronic stress are the factors that constitute the syndrome ^[12]. Role of insulin in development of acne is associated with increased prevalence of acne in females with PCOS ^[12]. This study was mainly intended to analyse the correlation between diabetes mellitus, dyslipidaemia, hypertension & visceral adiposity in acne vulgaris.

Material and Methods

A hospital based, analytical cross-sectional study was conducted among patients aged 14 years & above, irrespective of gender with acne vulgaris, irrespective of severity and attend the outpatient clinic of dermatology in Employees' State Insurance Corporation Medical College and Hospital, Sanathnagar, Hyderabad, Telangana State. Patients with hirsutism, irregular menstrual cycles, known history of cardiovascular disorders, lipid metabolism disorders, hepatic disorders, drug intake that affect lipid metabolism, diabetes, renal disorder, harmful habit of smoking and those who were not willing to participate in the study were excluded. The study was conducted for a period of 12 months (1st November 2020 to 30th October 2021). A sample size was calculated considering acne vulgaris prevalence of 50 p.c, and an absolute precision of 10 p.c, the calculated sample size was ≥ 100 , in the present study about one hundred and three patients were included using systematic random sampling method. IEC approval was obtained. A written informed consent was obtained from the patients after explaining them clearly about the study details in their vernacular language. Patient data was recorded on a standardized proforma that include demographic data, detailed clinical history, past history, personal history, family history, comorbidities, and laboratory investigations. History of alcohol consumption or smoking everyday with $>180\text{ml}$ or ≥ 10 cigarettes/beddi's was considered as having a habit of alcoholism or smoking. For laboratory investigations fasting blood sample was obtained under necessary precautions.

General examination and clinical examination of acne was done and grading was given according to Global Acne Grading System, each type of lesion was given a value depending on severity: no lesions=0, comedones=1, papules=2, pustules=3 and nodules=4 ^[2]. The score for each area (Local score) was calculated using the formula: Local score = Factor x Grade (0-4). The global score was the sum of local scores, and acne severity was graded using the global score (Table-1) ^[2]. In the present study a score of 1-18 was considered mild, 19-30 was considered moderate, 31-38 was considered severe and ≥ 39 was considered very severe.

Metabolic syndrome was diagnosed as per the criteria of the modified National Cholesterol Education Program-Adult Treatment Panel-III (NCEP-ATP III). According to the

NCEP-ATP III definition, metabolic syndrome is present if three or more of the following five criteria are met: waist circumference over 40 inches (men) or 35 inches (women), blood pressure over 130/85 mmHg, fasting triglyceride (TG) level over 150 mg/dl, fasting high-density lipoprotein (HDL) cholesterol level less than 40 mg/dl (men) or 50 mg/dl (women) and fasting blood sugar over 100 mg/dl ^[13]. Collected data was entered in Microsoft Excel-2019 and statistical analyses were performed using SPSS-23 (trial version) software. Data was presented as number (n) & percentage for categorical data or mean \pm standard deviations for continuous data. The baseline characteristics were compared by chi-square test for categorical variables and one way ANOVA test was used to compare between >2 dependent groups. Pearson correlation test was also performed on continuous variables. In all the tests performed, a *p*-value less than or equal to 0.05 was considered statistically significant.

Table 1: The Global Acne Grading System

Location	Factor
Forehead	2
Right cheek	2
Left cheek	2
Nose	1
Chin	1
Chest and upper back	3

Results

This study was conducted among one hundred and three (103) patients who were in accordance with the inclusion criteria. Among them majority, 57.3 p.c were females and 42.7 p.c were males. The mean age of the acne vulgaris patients was 38.5 ± 11.2 years. Majority of the patients were above 25 years age group, had a mixed diet, and family history of acne (Table-2). The mean waist circumference of the patients was 35.0 ± 3.80 inches, the mean SBP of the patients was 124.6 ± 12.18 mm of Hg, the mean DBP of the patients was 82.7 ± 11.06 mm of Hg, the mean TG level of the patients was 102.5 ± 26.68 mg/dL, the mean HDL level of the patients was 44.3 ± 5.40 mg/dL, and the mean FBS level of the patients was 119.5 ± 27.71 mg/dL (Table-2). The overall metabolic syndrome was present among 52.4 p.c of the patients and absent among 47.6 p.c of the patients. A harmful habit of alcoholism and smoking were present among 14.6 p.c and 18.4 p.c of the patients respectively. According to the GAGS the mean score of the acne vulgaris patients in the present study was 21.4 ± 9.29 and the grading of GAGS was 43.7 p.c of the patients were graded as mild, 35.9 p.c of the patients were graded as moderate, 20.4 p.c of the patients were graded as severe, and no patient was graded very severe. (Table-2).

Among the patients with metabolic syndrome the GAGS severity grading was increasing when compared those do not have metabolic syndrome, there exists an extreme statistically significant association between metabolic syndrome and GAGS (acne severity grading) with *p*-value <0.001 . As the age increases there was an increase in the severity grade of GAGS, even though there was statistically significant association between age and GAGS (acne severity grading). The severity grading of GAGS was increasing among females when compared to males. Among the patients with severe GAGS, the family history of acne was high (23.6%) when compared to those without family

history of acne (12.9%), there was no statistically significant association between family history of acne and GAGS (acne severity). Other variables like diet, history of alcoholism and smoking had no association with the severity of acne vulgaris. (Table-3).

Among the metabolic syndrome variables that included waist circumference (WC), blood pressure, triglyceride levels (TG), high density lipoprotein levels (HDL), and fasting blood sugar levels (FBS); there existed a statistically significant difference between HDL and GAGS severity grading with p-value <0.05, when compared to other variables (Table-4). Even though there was no statistically significant difference between WC, SBP, DBP, TG, FBS

and GAGS severity grading, there was an increase in the mean scores of WC, SBP, DBP, FBS from mild to severe grading of GAGS. The triglyceride levels had decreased from mild to severe grading of GAGS. All these results constitute that the variables of metabolic syndrome had an impact on the severity of acne vulgaris (Table-4). Even though there was no statistically significant correlation between GAGS disease severity and metabolic syndrome criteria, there was positive correlation between GAGS disease severity and WC, SBP, DBP, FBS and there was negative correlation between GAGS disease severity and TG, HDL (Table-5).

Table 2: Characteristics of Acne Patients

Variable	Findings
Gender: Male/Female (%)	44 (42.7%) / 59 (57.3%)
Age (years): Mean \pm SD	38.5 \pm 11.22
Age group: \leq 25 years (%) / $>$ 25 years (%)	15 (14.6%) / 88 (85.4%)
Waist circumference (WC) in inches: Mean \pm SD	35.0 \pm 3.80
Systolic Blood Pressure (SBP) in mm Hg: Mean \pm SD	124.6 \pm 12.18
Diastolic Blood Pressure (DBP) in mm Hg: Mean \pm SD	82.7 \pm 11.06
Triglyceride (TG) in mg/dL: Mean \pm SD	102.5 \pm 26.68
High Density Lipoprotein (HDL) in mg/dL: Mean \pm SD	44.3 \pm 5.40
Fasting Blood Sugar (FBS) in mg/dL: Mean \pm SD	119.5 \pm 27.71
Global Acne Grading System (GAGS) score: Mean \pm SD	21.4 \pm 9.29
Diet: Vegetarian (%) / Mixed (%)	13 (12.6%) / 90 (87.4%)
Alcoholism: Present (%) / Absent (%)	15 (14.6%) / 88 (85.4%)
Smoking: Present (%) / Absent (%)	19 (18.4%) / 84 (81.6%)
Family history of Acne: Present (%) / Absent (%)	72 (69.9%) / 31 (30.1%)
Metabolic Syndrome (MS): Present (%) / Absent (%)	54 (52.4%) / 49 (47.6%)
GAGS-severity: Mild (%) / Moderate (%) / Severe (%)	45 (43.7%) / 37 (35.9%) / 21 (20.4%)

Table 3: Association between Various Variables and Gags

Variable		Global Acne Grading System						χ ²	df	p-value
		Mild		Moderate		Severe				
		Number of patients	%	Number of patients	%	Number of patients	%			
Metabolic syndrome	Present	12	22.2%	31	57.4%	11	20.4%	26.559	2	0.0001
	Absent	33	67.3%	6	12.2%	10	20.4%			
Age group	≤ 25years	10	66.7%	2	13.3%	3	20.0%	4.617	2	0.099
	> 25 years	35	39.8%	35	39.8%	18	20.5%			
Gender	Male	23	52.3%	12	27.3%	9	20.5%	2.895	2	0.235
	Female	22	37.3%	25	42.4%	12	20.3%			
Diet	Vegetarian diet	8	61.5%	3	23.1%	2	15.4%	1.951	2	0.377
	Mixed diet	37	41.1%	34	37.8%	19	21.1%			
Alcoholism	Present	8	53.3%	6	40.0%	1	6.7%	2.076	2	0.354
	Absent	37	42.0%	31	35.2%	20	22.7%			
Smoking	Present	9	47.4%	5	26.3%	5	26.3%	1.072	2	0.585
	Absent	36	42.9%	32	38.1%	16	19.0%			
Family history of acne	Present	31	43.1%	24	33.3%	17	23.6%	1.687	2	0.430
	Absent	14	45.2%	13	41.9%	4	12.9%			

Table 4: Metabolic Syndrome In Relation To Gags

Variable	GAGS	Mean	Std. Deviation	F	df	p-value
WC	Mild	34.3189	4.38076	2.408	2	0.095
	Moderate	36.1038	3.54706			
	Severe	34.6919	2.35537			
SBP	Mild	123.6667	14.03729	0.696	2	0.501
	Moderate	124.1892	12.10564			
	Severe	127.3810	7.00340			
DBP	Mild	81.0667	10.50195	1.865	2	0.160
	Moderate	82.7027	13.04877			
	Severe	86.6667	7.30297			
TG	Mild	103.2667	27.62361	0.421	2	0.657
	Moderate	104.4324	28.09759			
	Severe	97.9048	22.42299			
HDL	Mild	45.6000	4.84487	3.853	2	0.024
	Moderate	42.4865	5.93774			
	Severe	45.1905	4.83342			
FBS	Mild	116.2000	29.35024	0.581	2	0.561
	Moderate	121.6216	25.70490			
	Severe	122.9048	28.05335			

Table-5: Correlation between Gags Disease Severity and Characteristics of Patients

Variable	r [^]	p-value
AGE	0.15	0.117
WC	0.14	0.148
SBP	0.13	0.19
DBP	0.16	0.087
TG	-0.04	0.689
HDL	-0.07	0.446
FBS	0.04	0.656
r [^] - Pearson correlation		

Discussion

Acne appears to be a widespread, complex skin disease that affects individuals of all age groups^[14]. In the present study, as the age increased the chances of developing acne also increased, these results were similar to Law M *et al.*^[14] conclusion. Yang Y *et al.*^[15], in their study reported that females were more vulnerable to acne than males, these results were similar to present study findings. In the present study, there was no statistically significant association between GAGS disease severity and age, gender these results were similar to Rostami Mogaddam M *et al.*^[16], and Nagpal *et al.*^[17] results. Emiroğlu N *et al.*^[3] in their study stated that the relationship between diet and acne appears to be uncertain in recent years, these results were similar to present study findings that diet has no statistically significant association with acne severity.

In the present study, there was no statistically significant difference between GAGS disease severity groups and WC, SBP, DBP, TG, FBS; these results were similar to Nagpal *et al.*^[17] study. In the present study, there was a statistically significant difference between GAGS disease severity groups and HDL which was similar to Beigh and Jain *et al.*^[18] study.

In the present study, it was reported that there was no significant correlation between GAGS disease severity and metabolic syndrome criteria these results were in accordance with Balta *et al.*^[19] study. The metabolic syndrome and the GAGS severity grading had an extreme statistically significant association in the present study. Ahmed GI *et al.*^[20], study results were similar to present study results.

Conclusion

There exists an association between acne vulgaris and

metabolic syndrome. Reduction in HDL will have a significant increase in the acne vulgaris severity. All the variables of metabolic syndrome may have an impact on the severity of acne vulgaris, to generalize further clinical studies on a larger scale should be conducted.

Limitations: Results cannot be generalized as the sample size was small.

Conflict of Interest: None to declare

Source of Funding: Nil

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