

Association of Acne Vulgaris with Metabolic Syndrome and Polycystic Ovarian Syndrome in Females: A Cross-Sectional Study

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Abstract

Introduction: Acne is one of the most common dermatological conditions encountered in daily practice. Recent studies have reported a strong association between acne and underlying systemic, endocrine disorders, predominantly polycystic ovarian syndrome (PCOS) and also few studies showing association with metabolic syndrome.

Objective: To study the association of acne vulgaris with metabolic syndrome and polycystic ovarian syndrome in female patients in the age group of 18-35years.

Methods and Materials: This is a cross-sectional study of 100 acne patients in the age group of 18-35years at the out-patient department of Dermatology at AJ

Institute of medical sciences, Mangalore from 2021 to February 2022.

Inclusion criteria: 1.Acne patients in the age group, 18yrs to 35yrs. 2. Patients with metabolic syndrome. 3. Patients with PCOS.

Exclusion criteria: Patients with Chronic illness like liver diseases, renal diseases, thyroid disorders also pregnant women, presence of active bacterial, viral infections, active inflammatory dermatosis and non-consenting patients were excluded. Each participant was evaluated by complete medical history, detailed dermatological examination, suitable investigations. Presence of PCOS was assessed using Rotterdam-criteria 2003. Patients are also evaluated for the presence of metabolic syndrome.

Results: The final analysis had 100 female patients with acne. The prevalence of PCOS was 40% in our study subjects. PCOS had shown statistically significant association with acne in our study patients ($p=0.047$). Other factors like body mass index, waist circumference did not show statistically significant association among acne patients with PCOS. Prevalence of metabolic-syndrome was 32% in our study subjects and it showed statistically highly significant association with acne in our study ($p=0.001$). Besides this other factors like body mass index, waist circumference, serum triglyceride levels also showed statistically highly significant association among acne patients with metabolic syndrome.

Conclusion: PCOS is a common disorder among women with acne vulgaris. Physicians should assess patients with severe grade of acne vulgaris in 2nd and 3rd decade for related metabolic and biochemical parameters to advice regarding the life style modifications to prevent further complications. Early diagnoses and treatment can avoid the possible complications.

Keywords: PCOS, Liver, Diabetes.

Introduction

Acne vulgaris is an inflammatory disorder of the pilosebaceous unit which affects many adolescents and young adults. It is common enough to be called a physiological process but is better regarded as a disease due to its inflammatory component and the disfigurement it produces on the face, which is socially and psychologically the most important body region. The peak incidence is between 14 to 17 years in women and 16 to 19 years in men. Sudden and profuse lesions erupting at a later age calls for investigations of the pituitary, adrenal cortex, and gonads.

The metabolic syndrome (MetS) consists of a constellation of metabolic abnormalities.

The diagnosis of MetS was based on the National Cholesterol Education Program and Adult Treatment Panel III by the presence of three or more of the following criteria. [2]

- Central obesity: WC of ≥ 102 cm in males and ≥ 88 cm in females are the cutoff points of abdominal girth.
- Hypertriglyceridemia: Triglyceride level ≥ 150 mg/dl or specific medication.
- Low HDL cholesterol: ≤ 40 mg/dl in males and ≤ 50 mg/dl in females or specific medication.

- Hypertension: Blood pressure ≥ 130 mmHg systolic or ≥ 85 mmHg diastolic or specific medication.
- Fasting plasma glucose level ≥ 100 mg/dl or specific medication or previously diagnosed type 2 diabetes mellitus.

Of all the potential pathological mechanisms of MetS, emerging evidence suggests that impaired insulin signaling and increased insulin resistance, as well as elevated status of chronic inflammation, are major risk factors that may induce skin diseases [3,4]. Polycystic ovary syndrome (PCOS) is a complex condition characterized by elevated androgen levels, menstrual irregularities, and/or small cysts on one or both ovaries [1]. The disorder can be morphological (polycystic ovaries) or predominantly biochemical (hyperandrogenemia). An important feature seen in these patients is the development of multiple closed comedones which rapidly transform into tender, lumpy nodules, distributed in the lower half of face and jaw-line (V distribution). These tend to persist beyond the usual course of 5-7 days. A pre-menstrual flare is also common. Acne lesions may not only be localized to the face, but may also be present on the chest, shoulders and back. Prompt relapse after stopping the treatment, strongly suggests a hormonal basis. Hence recognition of the patients with acne and their association with metabolic syndrome and polycystic ovarian syndrome is important. This helps in early management and prevention of cutaneous and emotional scars that last long.

Aims and Objectives

1. To study the association of acne vulgaris with metabolic syndrome and polycystic ovarian syndrome.

Methods and Materials

Source of Data: This is hospital based cross-sectional study. This study is conducted at Dermatology OPD of A.J Institute of Medical Sciences, Mangalore. Institutional ethics committee permission was obtained prior to the start of the study and written informed consent was obtained from all the patients.

Sample Size: 100 females.

Study Duration: March 2021 till February 2022.

Sample design: Cross-sectional descriptive study.

Inclusion Criteria: Patients with acne vulgaris with either metabolic syndrome or polycystic ovarian disease or both in the age group of 18yrs to 35yrs presenting to

the out-patient department of Dermatology at A.J Hospital and Research centre, Mangalore.

Exclusion Criteria

1. Patients with Chronic illness like liver diseases, renal diseases and thyroid disorders.
2. Pregnant women.
3. Active cutaneous bacterial and viral infections.
4. Active inflammatory dermatosis.
5. Non-consenting patients.

Description of the Process

The study design involves descriptive cross-sectional study. 100 females in the age group of 18-35yrs attending the dermatology OPD with complaints of acne vulgaris were selected for the study. Informed written consent was obtained from all the patients included in the study. All the individuals are screened for the exclusion criteria. And only the individuals satisfying the inclusion criteria and exclusion criteria were selected. Semi-structured questionnaire was used to collect the information regarding the sociodemographic profile, clinical history and investigation work-up. The study participants were subjected to thorough history taking and clinical examination. History of DM, HTN, and Dyslipidemia history of any drug intake were also noted. Complete cutaneous and systemic examination was done for each of the study participants. The diagnosis of acne vulgaris was made through clinical findings. Measurements of height, weight, body mass index, blood pressure and waist circumference was done.

Photographic documentation of the lesions was done through clinical photography taken with patients consent. WC was measured using the non-stretchable flexible tape in the horizontal position, just above the iliac crest, at the end of the normal expiration with the subject standing erect and looking straight forward and observer sitting in the front of subject. BMI was calculated as a ratio of weight in Kg divided by height in Meters squared (Kg/m^2) [Table 1]. Patients were subjected to relevant fasting blood tests like FBS, Lipid profile, USG Abdomen and Pelvis and values of corresponding reports were recorded.

Statistical Analysis

Data was entered in Microsoft Excel and analysed using statistical package for the social sciences(SPSS)software program , version 25.0. Data was statistically described

in terms of mean \pm standard deviation(\pm SD), frequencies (number of cases) and relative frequencies (percentages) when appropriate. Chi square test and Fishers exact test were used to find statistical associations between various variables .A value of $p < 0.05$ was considered statistically significant.

Results

A total of 100 females with acne vulgaris were enrolled in the study; their ages ranged from 18-35 years with a mean of 25.29 ± 4.76 (SD)yrs. Twenty-one patients (21%) were below the age of 20 years and 62 patients (62%) were between 21 and 30 years, 17 patients (17%) were above the age of 30 years. As per the WHO criteria, only 75% of the participants had BMI in normal weight range. The proportion of women, who were overweight and obese were 20% and 5% respectively in the study population. Waist circumference was high (>88 cm) among 39% of the study subjects. Among the study population, 54 patients (54%) had mild acne, 22 patients (22%) had moderate acne, 16 patients (16%) had severe acne, and 8 patients (8%) had very severe acne. (Table 2) Out of 100 acne patients 32(32%) were found to have metabolic syndrome and was statistically highly significant($p=0.001$). Among 32 patients with metabolic syndrome 3(9.4%) patients were below 20 years, 17 patients(53%) were between 21 and 30 years , 12 patients(37.5%) were above 30 years. Among metabolic syndrome patients group hypertension was found in 28 patients (87.5%) and it was highly significant ($p < 0.05$). Among 32 acne patients with metabolic syndrome 18 patients(56.3%) had BMI below 24.9, 12 patients(37.5%) had BMI between 25 to 30 and 2 patients(6.3%) had BMI above 30. The difference in the proportion of Metabolic syndrome and BMI was statistically highly significant($p=0.001$). Waist circumference was more than 88cm in 24 patients (75%) among 32 acne patients with metabolic syndrome and the difference was statistically highly significant ($p < 0.05$). Serum triglyceride level more than 150mg/dl was noted in 17 patients(53%) among 32 acne patients with metabolic syndrome and the difference was statistically highly significant.(p value =0.001). In our study the estimated frequency of PCOS in acne patients was 40%. The most common form of acne with PCOS was the papulopustular type which was found in 22 patients (55%). The face over mandibular region and the

chin were most commonly affected. Among the 40 patients with PCOS 29 (72.5%) patients had BMI below 24.9, 9 patients (22.5%) had BMI between 25-30 and 2(5%) patients had BMI above 30. The difference in the proportion of PCOS group and BMI was not statistically significant ($p=0.876$). Among the 40 patients with PCOS 19(47.5%) patients had high (>88cm) waist circumference, and the difference in the proportion of PCOS group and waist circumference status was not statistically significant ($P=0.155$). Obesity including raised BMI and waist circumference is not a criterion for the diagnosis of polycystic ovarian syndrome and the absence of obesity according to BMI doesn't exclude the diagnosis of polycystic ovarian syndrome.

Discussion

In our study, the mean age group of acne patients involved was 25.29 ± 4.76 yrs, while the minimum recorded age was 18 years and maximum was 35 years. This is similar to study done by Kinde Bliede et al. who studied the prevalence of PCOS in women with acne vulgaris among 150 female patients with acne.[5] In our study 83% of patients were below the age of 30 years and 17% were above the age of 30 years. Waist circumference above 88cm was among 39% of our 100 acne patients. Kinde Bliede et al. observed high waist circumference (>88cm) among 44.7% of his study group. This high percentage might be because Kinde Bliede et al. included acne patients in the age group of 18-43 years, wider age group range compared to our study.[6] WC is larger in males compared with females and larger in older adults compared with younger adults up to the age of 70 (Ford et al., 2003). Findings from the 1999–2000 NHANES, showed mean WC in males increased from 92 cm, among 20–29- year olds, to 105.4cm among 60–69-year olds, a 13.4-cm difference. After 70 years of age, mean WC was slightly (–3 cm) lower at 102.4 cm. Within the same age range, estimates in women were 5.9–8.1cm smaller compared with men. Mean female WC was 86.1, 97.4 and 94.3 cm in the 20–29, 60–69 and 70 years and above age groups, respectively. Although the trends in men and women were similar in respect to age, women had a smaller mean WC than men in every age category. The Data from an Epidemiological Study on the Insulin Resistance Syndrome (DESIR) study of 1868 men and 1939 women aged 30–64 years at baseline show median increase in

waist of 3 cm per 9 years or 0.33 cm per year in males, and 4 cm per 9 years or 0.44cm per year in females (Balkau et al., 2007).[7] Evidence from the Framingham Study shows that body fat distribution and fat depots could be better predictors of cardiovascular diseases (CVD) than BMI. [8] Population data from the European Prospective Investigation into Cancer and Nutrition of the Norfolk cohort showed that WC and waist-to-hip ratio were more consistent predictors of coronary heart disease than BMI. [9] Waist circumference alone may be a useful indicator of adiposity in Caucasian populations and thus indicating the risk of cardiovascular diseases. [10] In our study of 100 acne patients 28 patients (28%) had low HDL alone, 14 patients (14%) had high LDL alone and 31 patients (31%) had both HDL and LDL abnormal whereas remaining 27 patients (27%) had both HDL and LDL normal. Individuals with Low HDL levels carry a 2 to 3 fold increased mortality risk of coronary artery disease and stroke. [11] Two meta-analysis have shown that treatment with hydroxymethylglutaryl coenzyme A reductase inhibitors known to lower LDL cholesterol and to increase HDL cholesterol levels reduces the risk of stroke by 30%.[12] Annelies W.E.et al in his study also mentioned that low total LDL and HDL Cholesterol levels are all associated with an increased mortality risk. This adverse effect of low total and low fractionated cholesterol levels appeared to be related to increased mortality from infectious disease.[13] Normal BMI is seen among 75% of our study patients .And we observed no significant association between BMI and acne in our study similar to study done by Mohammad A Abusailik et al.who studied cutaneous manifestations of polycystic ovary syndrome among 146 patients.[14] In our study the prevalence of metabolic syndrome among 100 acne patients was 32%.This is similar to the prevalence observed by Del Prete et al .Del Prete et al observed a prevalence of 36% in his study. This high prevalence observed by Del Prete et al can be because of smaller sample size of his study compared to our study.[15] There is no significant association with regard to Fasting blood glucose in acne patients with metabolic syndrome in our study (p value=0.33). Abdelmawla et al. also observed no significant difference between acne vulgaris patients and control group as regard to fasting blood glucose.[16] Del Prete et al [17] and Emiro glu et al

[18] suggested that insulin resistance had some role to play in pathological sequel of acne. In our study we observed a highly significant association with regard to hypertension, BMI, waist circumference and serum triglyceride levels in acne patients with metabolic syndrome. And the association of acne patients with metabolic syndrome is also highly significant (p=0.001). Polycystic ovary syndrome [PCOS OR STEVEN LEVANTHAL SYNDROME] is being seen in increasing number of young girls. These patients ovulate infrequently or not at all, have multiple cysts in their ovaries and often have irregular menses, obesity, androgenic alopecia, hirsutism acne. In our study the estimated frequency of PCOS in acne patients was 40%. Rachit Mathur et al. observed a prevalence of 44% in his study on acne patients. This high prevalence observed in Rachit Mathur et al. study can be due to wide age range of study subjects (15-45 years) included. [19] There was no statistically significant difference regarding BMI between acne patients with PCOS and acne patients without PCOS. This is similar to study by Soodabeh Zandi et al on prevalence of PCOS in women with acne. [20] The most common form of acne with PCOS was the papulopustular type which was found in 22 patients (55%). The face over mandibular region and the chin were most commonly affected similar to study done by Mohammad A Abusailik et al. [21] However in our study the association of acne patients with PCOS was statistically significant (p=0.047).

Table 1: WHO BMI Grading

BMI(Kg/M2)	Nutritional Status
<18.5	Underweight
18.5-24.9	Normal Weight
25-29.9	Pre-Obesity
>30	Obesity

Table 2: Association of acne vulgaris with metabolic syndrome and corresponding p-values. (p-value <0.005 is taken as significant).

		Met S(N=32)	No Met S(N=68)	Chi square/ Fishers exact test p value
AGE	20 and below	3	18	0.0001
	21 30	17	45	
	Above 30	12	5	
	Total	32	68	
HTN	Yes	28	13	0.0001
	No	4	55	

Limitations

1. Useful indicators of PCOS like hormonal assay was not done in the study since most of the patients could not afford for such investigations.
2. Follow up of the patients after treating the underlying PCOS or MetS is not done in our study as our study is single time cross-sectional study. Further studies can be aimed based on our study including large sample size.

Conclusion

The prevalence of PCOS in our acne study patients was statistically significant. On the basis of these findings we can conclude that PCOS is present in almost one third of our acne study patients. Therefore it is important that all female patients presenting with acne should be screened for PCOS by proper history, clinical examinations and suitable investigations. The prevalence of metabolic syndrome in cases of acne vulgaris was statistically highly significant. This study shows that acne vulgaris in 2nd or 3rd decade could be useful in clinical markers for the underlying metabolic syndrome and PCOS. Hence early screening for their underlying conditions is advisable. Physicians should assess patients with severe grade of acne vulgaris in 2nd and 3rd decade for related metabolic and biochemical parameters to advice regarding the life style modifications to prevent further cardiovascular complications. Also can help in diagnosing the underlying PCOS which can be associated with infertility. This study highlights the importance of evaluating the associated risk factors of metabolic syndrome and PCOS in patient with acne vulgaris.

	Total	32	68	
BMI(Kg/m ²)	< 24.9	18	57	0.008
	25 - 30	12	8	
	Above 30	2	3	
	Total	32	68	
WC(cm)	>88	24	15	0.0001
	< 88	8	53	
	Total	32	68	
FBS(mg/dl)	>100	11	17	0.33
	<100	21	51	
	Total	32	68	
S.HDL(mg/dl)	< 50	25	34	0.008
	>50	7	34	
	Total	32	68	
S.TGs(mg/dl)	>150	17	14	0.001
	<150	15	54	
	Total	32	68	

Table 3: Association of acne vulgaris with polycystic ovarian syndrome and corresponding p-values. (P-value < 0.005 is taken as significant).

		PCOS(N=40)	NO PCOS(N=60)	Chi square/Fishers exact test p value
AGE	20 and Below	6	15	0.37
	21 - 30	28	34	
	Above 30	6	11	
	Total	40	60	
HTN	Yes	15	26	0.148
	No	25	34	
	Total	40	60	
BMI(Kg/m ²)	< 24.9	29	46	0.876
	25 - 30	9	11	
	Above 30	2	3	
	Total	40	60	
WC(cm)	>88	19	20	0.155
	< 88	21	40	

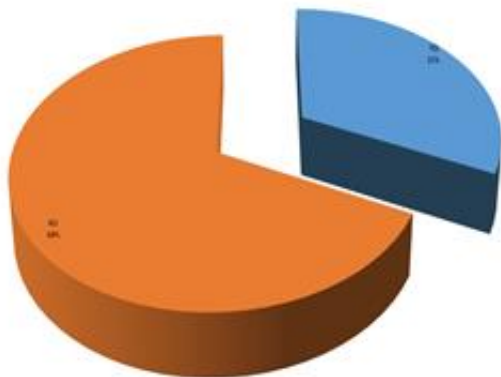


Fig 1: Metabolic syndrome is seen in 32 % of our 100 acne patients.



Fig 4: 20 year's female with grade III acne with papules and pustules over bilateral malar areas and forehead with hirsutism over upper lip.



Fig 2: 28 year's female with metabolic syndrome showing papules and pustules (Grade III acne) over bilateral malar areas. She also had truncal acne.

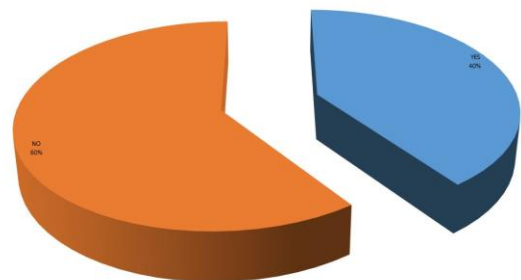


Fig. 3: PCOS is seen in 40% of our 100 acne patients

References

1. Umland EM, Weinstein LC, Buchanan EM. Menstruationrelated disorders. In: DiPiro JT, Talbert RL, Yee GC, et al. Pharmacotherapy: A Pathophysiologic Approach, 8th ed. New York:McGraw-Hill; 2011:1393.
2. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive summary of the third report of the national cholesterol education program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult treatment panel III). JAMA 2001;285:2486-97.
3. McCracken E, Monaghan M, Sreenivasan S. Pathophysiology of the metabolic syndrome. Clin Dermatol. (2018) 36:14– 20. doi: 10.1016/j.clindermatol.2017.09.004.
4. Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. Lancet. (2005) 365:1415–28. doi: 10.1016/S0140-6736(05)66378-7.
5. Bliede et al :Prevalence of polycystic ovary syndrome in women with acne vulgaris ; AJRDES,3(1):5-13,2020;Article no.AJRDES.57450

6. J Stevens et al : Associations between gender, age and waist circumference:. Eur J Clin Nutr. 2010 January ; 64(1): 6–15.
7. Britton KA, Massaro JM, Murabito JM, Kreger BE, Hoffmann U, Fox CS. Body fat distribution, incident cardiovascular disease, cancer, and all-cause mortality. J Am Coll Cardiol 2013; 62: 921–925, 10.1016/j.jacc.2013.06.027.
8. Canoy D, Boekholdt SM, Wareham N, Luben R, Welch A, Bingham S, et al. Body fat distribution and risk of coronary heart disease in men and women in the European prospective investigation into cancer and nutrition in Norfolk cohort: a population-based prospective study. Circulation 2007; 116: 2933–2943.
9. TS Han et al.The influence of height and age on waist circumference as a index of adiposity in adults;International Journal of Obesity :1997,21,83-89.
10. Annelies W.E.Weverling-Rijnburger,MD et al.High density Vs low density lipoprotein cholesterol as the risk factor for coronary artery disease and stroke in old age:Vol 163, July 14 2003.
11. Blauw GJ ,Lagaay AM,Smelt AH,Westendorp RG;Stroke , statins and cholesterol :A meta-analysis of randomized,placebo-controlled,double-blind trials with HMG-CoA reductase.Stroke.1997;28:946-950.
12. Mohammad A Abusailik et al :Cutaneous manifestation of polycystic ovary syndrome: Sept 2021.
13. Del prete m., Mauriello m., Faggiano a., Di somma c., Monfrecola g., Fabbrocini g. and Colao a.: Insulin resistance and acne: A new risk factor for men? Endocrine, 42 (3): 555-60, 2012.
14. Abdelmawla M., Esawy A., Khater E. and Khalifa N.: Insulin resistance in androgenetic alopecia and acne vulgaris. Egyptian Journal of Dermatology and Venerology, 39 (2): 83-8, 2019.
15. Emiroglu N., Cengiz F.P. and Kemeriz F.: Insulin resistance in severe acne vulgaris. Advances in Dermatology and Allergology/Poste,py Dermatologii i Alergologii, 32 (4): 281, 2015.
16. Journal of Dental and medical sciences :vol-21,Issue 2 Ser.13(Feb.2022)PP 38-41.
17. Soodabeh Zandi et al : Prevalence of pcos in women with acne :hormone profiles and clinical findings:Journal of Pakistan association of Dermatologist 2010;20:184-198.